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ABSTRACT

This set of activities is intended to assist home economics teachers in incorporating basic energy education concepts into traditional home economics topics. Awareness activities that are intended to help students develop an understanding of fundamental energy conservation concepts and, at the same time, apply these concepts in home economics activities, are grouped according to the following home economics subject areas: family and personal development, food, child development, clothing and textiles, and housing and interior design. The concept development portion of the individual activities may include such activities as reading, performing experiments, solving problems, interacting with a group, playing games, and acting out roles. The application phase is designed to enable students to apply the new concept to various situations or problems and may include the same types of activities that were included in the concept development phase plus a range of other activities, including debates, panels, simulations, surveys, design and construction projects, and community or school projects. (MN)

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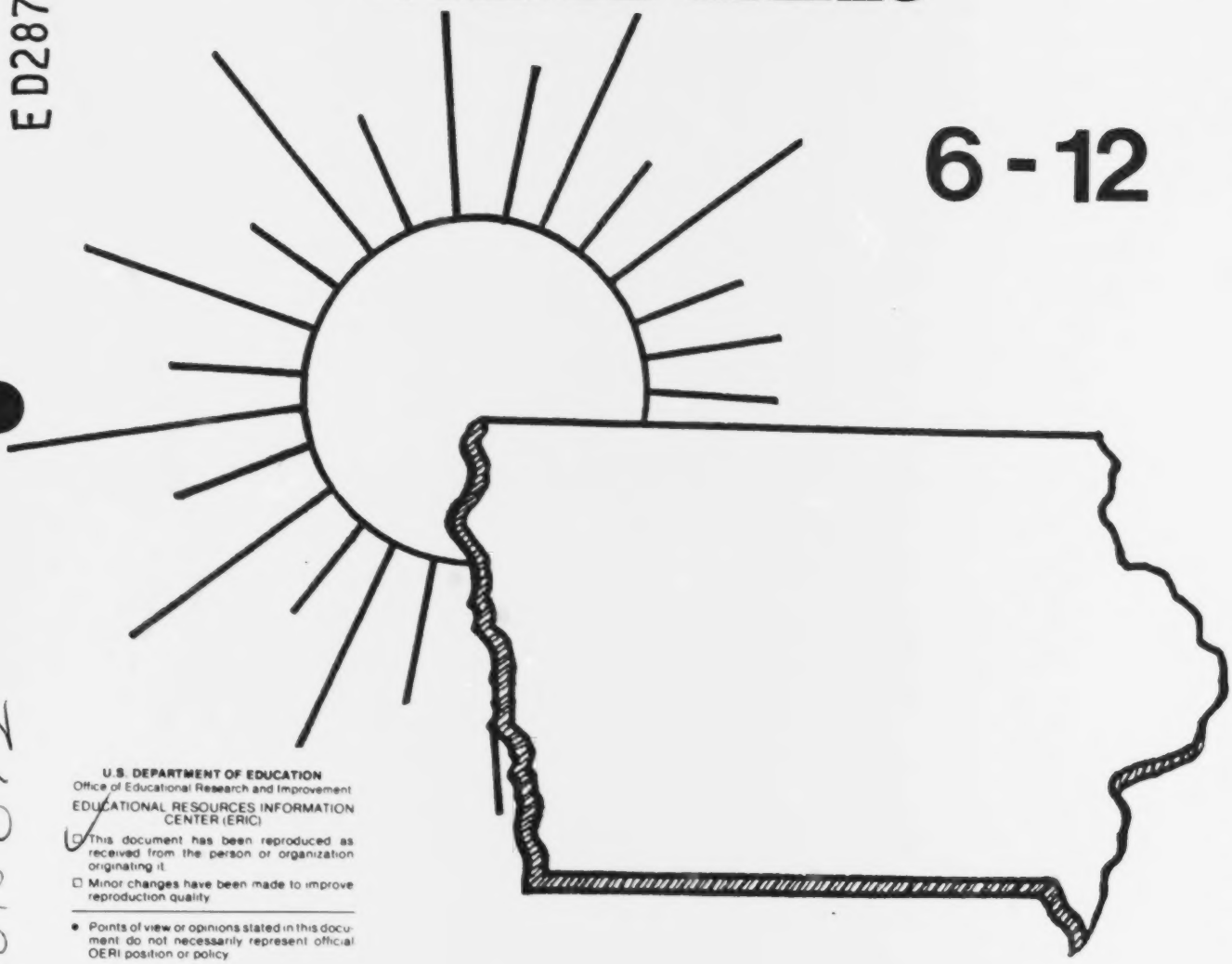
IOWA DEVELOPED ENERGY ACTIVITY SAMPLER

ED287096

6-12



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HOME ECONOMICS

Revised 1987

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REVISED IOWA DEVELOPED ENERGY ACTIVITY SAMPLER - IDEAS

INTRODUCTION TO IDEAS

The revised IDEAS were developed from the Energy Conservation Activity Packets, (ECAPS), by Ruth Bakke, and Iowa Developed Energy Activity Sampler (IDEAS), developed by Dr. Doris G. Simonis under the auspices of the Iowa Energy Policy Council and the Iowa Department of Public Instruction, now the Iowa Department of Education. An "infusion model" was used as a basic framework which recognized the interdisciplinary nature of energy education concepts. These included:

1. Energy is basic.
2. Energy usefulness is limited.
3. Environment is impacted by energy exchanges.
4. Energy conservation is needed.
5. The future of energy is ours to shape and share.

The revised IDEAS adheres to these concepts and provides activities that utilize a learning cycle to develop a knowledgeable student population concerning energy matters. Decision-making skills are emphasized and developing an energy conservation ethic is a major goal.

Under the joint sponsorship of the Iowa Department of Education, Duane Toomsen, Environmental and Energy Education Consultant, and the Energy Division of the Iowa Department of Natural Resources, Dr. W. Tony Heiting, Coordinator; the revised Iowa Developed Energy Activity Sampler (IDEAS) was created to meet the continuing need for energy education from the 1980's into the twenty-first century.

Conservation of natural resources and environmental awareness has been mandated by the State of Iowa to become a part of the quality education experienced by Iowa's future citizens in grades K-12. Energy is an integral part of our nation's natural resource base. The major emphasis of IDEAS is to provide uniquely designed K-12 classroom activities that are adaptable into various classroom situations, i.e., highly populated, urban schools to less populated rural facilities. The focal points of IDEAS are: energy concerns, impacts, choices, challenges, and conservation.

Revised IDEAS adopts a learning cycle strategy based upon the learning theory of Jean Piaget. The cycle has three phases: awareness, concept development and application. Activities are loosely structured to allow for student exploring, hypothesizing, and decision-making.

Awareness activities encourage students to experience a new idea, phenomenon or perception. A variety of experiences should stimulate the students' interest, appreciation, and initiate a positive attitude toward the concept to be formulated. Concept development involves the building of a concept of energy based upon the awareness phase. Concept development may include such activities as reading, performing experiments, solving problems, group interactions, games and role-playing in order to reinforce the developing concept. The application phase is designed to enable the student to apply the new concept to various situations or problems. Application activities may include the same types of activities plus a gamut of others, including debates, panels, simulations, surveys, designing, constructing and community or school projects.

This learning cycle approach integrates content with processes and encourages the development of higher level reasoning and thinking skills. The interdisciplinary importance of energy education is emphasized.

The activity format used in the revised edition of IDEAS includes a title, subject and grade level designation, a short description of the activity, learning objectives, materials needed, approximate time required, and descriptions of the three phases of the activity. A suggested evaluation section has been included, in most packets, to assist the instructor and/or learner in determining the extent to which each learner achieved each objective. Follow-up or background information and a detailed activity description complete the format.

Iowa is an excellent example of how energy is an interrelated and interdependent resource. Iowa imports 98% of the energy it uses and has a high potential for reducing its dependence on outside energy sources through conservation and alternative energy forms. Iowa's current energy dependence has a major impact on Iowa's economy and the ability of the state to compete in the industrial and agricultural community. All segments of Iowa's society involving service-related employment, agriculture, and industry, are impacted by energy costs and availability.

The most obvious means of energy reduction is energy conservation. More efficient use of energy resources available in Iowa (i.e. coal, wind, hydro, solar, gasohol, biomass) can have a significant impact on the cost of production/distribution factors as fossil fuels begin to diminish in the twenty-first century.

The revised IDEAS were developed by classroom teachers who realize the need to provide students with an enriched curriculum. Iowa's tradition of excellence in education has always pointed toward an improved future for our youth. IDEAS will provide the creative educator with a multitude of activities from which they can choose, adapt, and improve.

The professional educator who uses IDEAS may adapt the activities for any classroom setting. Students will be given the basis to form an energy attitude, ethic, and philosophy which will serve them and the citizens of Iowa throughout life.

Members of the IDEAS Revision Committee

Duane Toomsen, Environmental and Energy Consultant, Department of Education

Dr. Tony Heiting, Research/Education Director, Energy Division, Iowa Department of Natural Resources.

Dr. Bob Vanden Branden, University of Northern Iowa, editor.

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HOME ECONOMICS

INTRODUCTION

Energy is used in all areas of our lives, and therefore, needs to be included in all of Home Economics education. Students need to become aware of our current energy resources and how to conserve them for future use.

Energy is involved in the manufacturing, packaging, and distribution of all consumable and nonconsumable materials used in every realm of Home Economics. Therefore, all Home Economics classes offered should address the concerns of energy conservation and use.

The following activities are designed to fit into the various areas of Home Economics curriculum. The activities are divided into five sections; 1) Family and Personal Development; 2) Foods; 3) Child Development; 4) Clothing and Textiles; and 5) Housing and Interior Design. Many of the activities could be included in more than one of the five sections.

These activities are flexible and can be adapted for different teaching styles and classroom facilities. The teacher may use the activity in it's entirety, or can change it to use only the parts that pertain to their specific situation.

The goal of these activities is to provide the teacher with energy background; fun, interesting activities that can be adapted with minimum preparation time; and which have a high degree of student success.

A suggested evaluation has been included for each activity to give the teacher an option on a method of evaluation.

If we can work together to teach our children to be more energy aware, we will all have a brighter and more successful future.

Special thanks to Richard Delagardelle, Anamosa West Middle School, Anamosa, Iowa, who contributed to this document.

A very special thanks to Robert P. Rye, Jr. and his staff for the enjoyment and use of the Conservation Education Center, Springbrook State Park.

This page is for the teacher who wants to know more about energy terms and how they relate to the following activities for the classroom.

I. Energy Definition: Energy is the ability to move something by pushing or pulling it.

II. Forms

A. Potential: stored energy
B. Kinetic: motion energy

III. Kinds of Energy

A. Heat
B. Light
C. Chemical
D. Sound
E. Mechanical
F. Electricity

IV. Sources of Energy

A. Solar
B. Wind
C. Water
D. Fossil Fuels: coal, oil, natural gas
E. Nuclear
F. Biomass: wood, garbage, food

GOOD GROOMING - GOOD FOR ALL OF US!

SUBJECT Home Economics
Personal Care

LEVEL 6 - 8

ACTIVITY IN BRIEF

Use role playing and a take-home experiment to determine methods of conserving energy in grooming.

OBJECTIVE

After the completion of this activity, each student will be able to describe ways in which energy is consumed and may be conserved in bathing and grooming by all family members.

MATERIALS

paper and pencil

TIME

3 class periods and take home

LEARNING CYCLE

AWARENESS - Ask students which uses more water, shower or tub? After discussion, assign the following experiment to be tested at home. Most people think tub baths use less water than showers. To test this theory, do the following: 1) Fill your bathtub as you usually do before taking a bath, but before you step into the tub, measure the water. If you add any water while bathing, remeasure when you step out. 2) The next time you take a shower, put a stopper in the drain. Then take your shower as you usually do. When you finish, measure the water before removing the drain. Record and compare results.

CONCEPT DEVELOPMENT - Divide class into three groups. Each group list all activities which are conducted in a 24 hour time period which deal with personal care. One group should pantomine the activities using convenience products which consume energy, i.e. electric razor, electric toothbrush, etc; the second group should pantomine substituting <u>personal</u> energy, i.e. towel-drying hair, quick shower instead of long bath, etc., while the third group keeps a summary sheet of how energy can be saved. <u>Time:</u> 1 period planning, 1 period doing, or 60 minutes.

APPLICATION - After recording energy saving tips on the summary sheet, have all students brainstorm as many tips as they can come up with to add to the list to save energy in bathing and grooming by all family members. Present background information to add to their lists.

EVALUATION - Ask each student to list at least 25 grooming habits their family follows that use energy. Have students analyze their list and identify at least ten habits they could change in order to conserve energy in grooming.

FOLLOW-UP/BACRGROUND INFORMATION

Using grooming tips from background information, student chooses an activity:

a. make a bulletin board
b. make a word scramble or crossowrd puzzle
c. write a short script for a puppet show
d. put on a puppet show for younger students

SOURCES

Energy Management Strategies, Public Service Company of Colorado, 1982, Energy and Mans Environment. Superific Science, Book XI, Learning About Energy, Lorraine Conway, developed by Viki Van Ryswyk.

GOOD GROOMING - GOOD FOR ALL OF US!

ACTIVITY

I. Overview - Grooming involves the consumption of hot water, electricity, and petroleum products. The simplest, most direct way to reduce the energy used for grooming is to limit the use of equipment which requires electricity. Another way is to restrict the use of hot water.

II. The following are tips to aid in saving energy while grooming:

A. When no longer in use, equipment should be turned off, disconnected, and stored (out of reach of young children).

B. Electric equipment should be properly maintained. Check for faulty wiring, dials, thermostats, and seals. Keep equipment clean.

C. Use equipment only when necessary. For example, air dry hair when possible, brush your teeth "by hand", and polish your shoes "by hand".

D. Keep light fixtures in bathroom clean.

E. Keep exhaust fans and ventilators clean.

F. An electric shaver may be more energy-conserving than shaving with a blade if a great deal of hot water is used, not to mention shaving cream. Having your own shaver instead of disposables saves petroleum.

G. Encourage members of your family to bathe one after the other to take advantage of the warmth of the fixture (and room) from previous use.

H. Avoid drafts near the tub or shower which would encourage the use of a higher water temperature.

I. Check for leaking faucets.

J. Take short showers instead of baths.

K. Reduce the duration of showers.

L. Fill the lavatory with warm water, rather than allowing it to run when washing or shaving.

M. During winter, allow the water from baths to cool (releasing heat to the bathroom) before draining.

N. Air dry your hair whenever possible.

THE BEAD GAME

SUBJECT Home Economics
Personal & Family Relations

LEVEL 6-12

ACTIVITY IN BRIEF

The students will analyze the energy situation in the United States by discussion, participation in the bead game, and written analysis.

OBJECTIVE

Each student will: 1) explain the historic progression of man related to his increase in productivity and energy consumption, and 2) describe how energy is used in each sector of society (industry, commercial, residential, transportation).

MATERIALS

TIME 1 class period

films (see background information), a supply of colored plastic or ceramic beads of five different colors, needles and thread, total approximate cost of materials: $4.00 to $6.00.

LEARNING CYCLE

AWARENESS - Display bulletin board. Discuss the implications of its message. Include an in-depth discussion of the relationship between Gross National Product, Standard of Living, Energy Consumption, and Population Growth.

CONCEPT DEVELOPMENT - Build awareness of the importance of individual energy conservation and encourage students to use energy wisely. Survey the students. How many are using energy-saving methods to reduce the use of electricity, gas, or other forms of energy? Make a list of these energy conservation habits. Play the "Bead Game" developed by EME.

APPLICATION - After recording results from the Bead Game, have the class attempt to correctly label each color bead as to the resource it represented. Have students complete the analysis and discussion questions, provided at the end of the Bead Game directions.

EVALUATION - Have students relate in writing how the Bead Game represents real life. Have students predict what energy resources will be available when they are age 40; what countries will hold most of these resources.

FOLLOW-UP/BACKGROUND INFORMATION

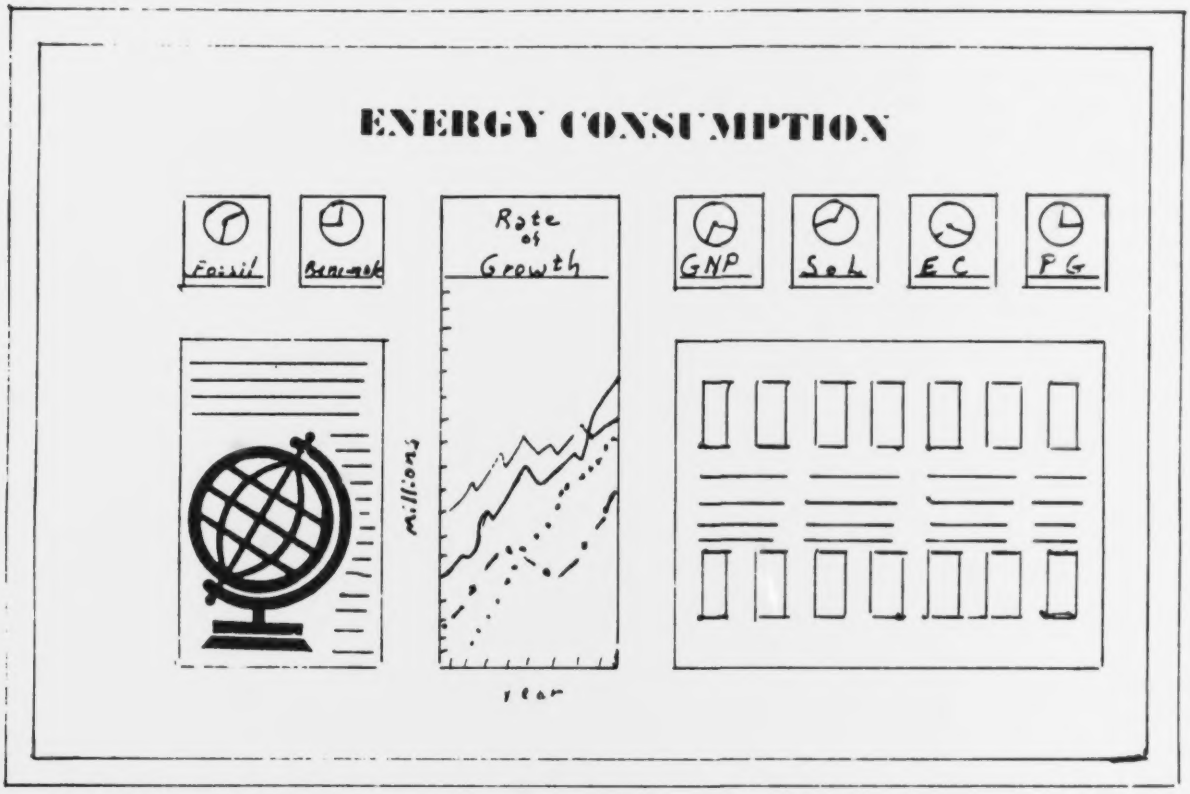
Films:

Energy: "A National Issue"
"Living with Energy"

SOURCE OF ACTIVITY

The "Bead Game" was developed by Energy and Man's Environment.

THE BEAD GAME



Directions for Bead Game:

1. Prior to class, place beads in the following proportions into a 35mm film cannister:

   - Black (coal) 50%
   - Red (uranium) 3%
   - White (natural gas) 10%
   - Blue (oil) 37%
   - Yellow (solar) a quantity exceeding coal

   a. If possible, crush some of the yellow beads before putting them into the canisters. If you can get them, it is a good idea to put in a very few yellow beads which are larger (especially the center hole).

2. Before the class arrives, hold the canister and heave the contents forcefully towards the ceiling so that they spread out over a wide area. An alternative is to take a small number and place them under an object so that they are not in plain view, and then throw out the rest of the beads.

3. When class starts, divide them into five teams or companies. Assign each group a resource by color (not name; that is, do not tell them what resource is represented by what color). Give each team a needle with a foot of string already threaded and knotted. Make sure that the solar

company gets a much larger needle, on which the normal sized beads cannot possibly fit, but that the large holed bead will. Try not to let them know that their needle is any different from the rest.

4. The rules are that each team will have a total of two minutes to gather and thread as many of their colored resource as possible. Tell them that the winning team will receive a prize. Only beads threaded will be counted. (Note later how many teams spent too much time finding and not enough converting the resource into usable form or energy.) Stress that they must stop when the time is up.

5. Begin the 2 minute search.

6. At the end of two minutes, have them count how many beads are now strung. Record this on the board. (During the search, notice whether anyone isn't following the rules by starting early or running overtime, or whether anyone is greatly disrupting the environment.)

7. Tell them that they will have one more chance. By now, the yellow team will be crying about how life is unfair (dispense the kleenex). Repeat steps 5 and 6.

8. Make a mental note of any increased efficiency in technique or time use.

9. Tell them that there will be one more final round in which to win. This time allow four minutes.

10. Record the results of how many were gathered during round three and then total all three rounds and distribute the prizes. No doubt several groups will smell a rat by now.

ANALYSIS & DISCUSSION:

1. Have the class attempt to correctly label each color as to the resource it represented.

2. Did any group disregard the rules and collect another color? Is this realistic? Do oil corporations buy uranium mines? Diversification!

3. What does the prize represent? Profit!

4. In most cases, the number of beads collected in round three will be less than round two and perhaps one, even though more time was given; why? Here is an excellent opportunity to discuss a) diminishing resources. We can generalize that there are less than when we started probably less than we have now gathered are left, but we cannot determine how many are left. b) Law of diminishing returns fits in well. Our companies invested twice the labor and perhaps capital yet did not do better. c) Net energy profit also applies. If the energy (it takes energy to get energy) required to obtain the resource exceeds the energy gathered, then there is no net energy profit. d) Opportunity cost. Companies which divert capital to develop new resource technologies are foregoing current income or profit. Thus, perhaps the incentives must be great to forego current opportunities. Obviously, there is a great deal of economics in this lesson.

5. Ask the class if any of them moved desks, books, rugs, etc. without putting them back. How does the current environment compare with the one before you began? Does the energy gained justify the damage? Stress the idea of tradeoffs (coal and air pollution, or strip mining of land, etc.)

6. Were some resources harder to find than others? Is this a mirror of the real world?

7. Now to our poor solar group. Abundance of a resource does not result in ease of gathering and especially utilization. Some solar is easily used (passive for heating represented by the larger yellow beads). However, technological breakthroughs may be necessary to fully capitalize upon a particular source.

8. If someone found the hidden cache, discuss the ideas of pockets of resources.

OPTIONS:

1. You may teach graphing concepts in recording the results of each search.

2. You can give each team money, have them bid to collect a particular resource, charge them for the opportunity, and award a monetary value to each bead collected.

NOTE: The "Bead Game" was developed by Energy and Man's Environment.

BACKGROUND INFORMATION
ENERGY REALITIES IN THE UNITED STATES

I. History of Man and Energy

In the primitive days of man, the average life span was only 18 years. Survival of the fittest was the one and only concern of these people. Most died of exposure to the elements, starvation, or falling prey to wild animals or human enemies. The average human worked 33% of his life.

Later, when man learned about fire and the domestication of animals, his life span was extended and his quality of life improved through harnessing the animal power for increased agriculture production. Man lived an average of 35 years and spent only 28% of his life working.

The dawn of the industrial age revolutionized man. Machines took over the heavy burdens placed upon man and animal. Man had more time for leisure, medical improvements were occurring, and the average life expectancy grew to 70 years or more. Man became more productive at this point then ever before in his history. This productivity has continued to grow and multiply.

It has been estimated to require the human energy of more than 80 servants for every adult and child to live as well as we do today without using machinery and to maintain our current standard of living without industrial power use.

Americans account for 6% of the world's population, yet consume 33% of the world's energy resources. Much of the energy consumed is reserved for convenience and luxury. Americans have been labeled "energy hogs" and "wasteful" in their actions. Many would have to admit their guilt. But look at the energy-intensive industries in this country. Agriculture, in particular, is considered a way of converting a barrel of oil into a bushel of wheat. The technology, talent, and deep sense of humanity has given the United States the ability to feed much of the world—all because of the energy intensity of agricultural production.

II. Energy Crisis or Energy Transition?

Crisis infers a temporary situation that will eventually go away — with a few, if any changes. The fossil fuels are finite sources of energy and the days of cheap and available oil, gas and coal are gone forever. Rather than thinking of this energy dilemma as a crisis, it would be better to think of it as an energy transition. Changes are being mandated by the demands of nature. The fossil fuels are limited. Americans must make a transition from total dependence on fossil fuels to dependence on other energy sources that are cheap, reliable, available, and, hopefully, located within the boundaries of the U.S. This energy transition will also mandate some serious lifestyle changes. Maybe Americans will become less dependent upon the car, recycle more, or maybe they will demand fewer items that require an intense amount of energy to produce (such as the use of expensive packaging). The fact remains, however, that Americans will change their habits that waste energy and become conscious of their responsibility to conserve every source of energy for the good of themselves, their neighbors, and their country.

A. Energy Demands

As previously discussed, machines help man to be productive. Historically, the more power-driven machinery workers use, the higher their productivity. The more productive a nations is, the better off it is economically.

Today, the U.S. population is approximately 235 million people. It is expected to reach 264 million by the year 2000. This will result in a proportionate amount of energy usage.

The fuel consumption in the United States looks like this:

	Today		Year 2000
Domestic Oil	26%	Oil	22%
Imported Oil	23%	Natural Gas	16%
Natural Gas	26%	Coal (heating)	10%
Coal) Generation	18%	Solar (heating)	4%
Nuclear) of	4%	Electricity	48%
Hydro) Electricity	3%	(Hydro	
		(Coal	
		(Nuclear	

B. Who Uses the Energy?

Industry	36%
Commercial & Government	15%
Residential	21%
Transportation	
Private Vehicles	18%
Air, Bus, rail, ships trucks, etc.	10%

C. Gross National Product

The definition of Gross National Product is the total market value of all the goods and services produced by a nation during a specific time. An important factor with energy consumption is that a country's standard of living correlates directly with production and energy consumption. A high standard of living is achieved when a country produces a large number of goods and services (high GNP). When production increases, so does energy consumption, and the standard of living improves. The United States enjoys a very high standard of living. Energy consumption in the U.S. also is very high. The more productive a country is, the more energy that country consumes.

D. Increases !!!

Ideally, the population is going to increase as is the work force. If the workforce becomes large, the GNP will go up which will cause a rise in energy consumption. This improves the standard of living!

Understand that along with the increases incurred, the bottom line is the incentive of each individual to be productive. It is pointless to

build new power plants if the people are not going to work. In the United States, the incentive of its work force to produce goods and services is primarily the profit motive. In general terms, more production is tantamount to greater profits. This explains, very simply, why the U.S. enjoys a very high standard of living which surpasses every other country in the world. People are rewarded for being productive.

If the U.S. is to maintain the standard of living with which it has grown accustomed, it must have adequate energy to supply those needs. This means that the U.S. will have to become dependent on domestic energy sources as soon as possible. No single energy source will meet the energy demands upon it. The energy will have to come from a variety of available sources.

VII. Energy Sources

Energy sources should meet certain criteria regardless of origin in order to be economically utilized. They are:

Reliability
Availability
Economy

There are several sources of energy, but unless those sources meet all three criteria, they are inefficient. For what benefit would solar energy be if there were only four days of sunshine per month? It would not meet any of the three criteria. How could wind be a viable energy source if it were available on an average of 3 miles per hour or less?

Energy, with all its ramifications, is indeed a complex science. A solution to one source of energy is not necessarily a panacea in solving all the other problems involved.

The point is that no single energy source can possibly meet the entire needs of this growing country and growing world. There must be many energy sources, and we must learn to use them together so that the standard of living can be maintained and improved.

For information on specific energy sources, write:

Electricity - Today's Technologies,
Tomorrow's Alternatives
Electric Power Research Institute
Communications Division
P.O. Box 10412
Pala Alto, CA 94303

Center for Renewable Resources
1001 Connecticut Avenue NW,
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SOLAR HOT DOG COOKER

SUBJECT Home Economics
Foods

LEVEL 6 - 8

ACTIVITY IN BRIEF

Students will be able to explore the energy potential of the sun by constructing and using a solar cooker.

OBJECTIVE

Each student will be able to:
- construct a solar cooker, and
- explain the principle which enables cooking in a solar oven.

MATERIALS

Oatmeal container, aluminum foil, rubber cement, ruler, pencil, scissors, unpainted wire coat hanger, shoebox, wire cutter, hot dogs.

TIME

1 hour

LEARNING CYCLE

AWARENESS - In small groups, brainstorm all the possible ways to cook hotdogs. List all on paper. Compare the lists with the rest of the class, so others have a chance to add methods they may have forgotten.

CONCEPT DEVELOPMENT - Have students check the methods listed which do not require electrical energy. Combine all ideas which do not use electrical energy and discuss advantages/disadvantages of time/space used in each.

APPLICATION - Use solar energy to cook hotdogs with a solar hot dog cooker made by the students.

EVALUATION - Have each student, alone or in small groups, construct a solar cooker. Have students write an explanation of principles involved in solar cooking.

FOLLOW-UP/BACKGROUND INFORMATION

You may have the students brainstorm other kinds of foods that could be cooked in the solar oven. You may want to compare cooking times of different foods or cooking times of the same food a different times of the day.

SOURCE OF ACTIVITY

Adapted from "Solar Cooking" from Minnesota Energy Activities, Minnesota Department of Education, Minnesota Energy Agency, Series G, Card 1, by Viki Van Ryswyk

Solar Hot Dog Cooker

Students identify all the possible methods of cooking hotdogs (boiling, baking, broiling, steaming, frying, using range top, oven, broiler, microwave, fireplace, etc.) They compare their lists to come up with the greatest possible number of solutions.

Take this combined list and determine which methods of cooking do not use electrical energy. Fireplace, campfire, and solar oven do not use electricity. Of these three, the first two involve the use of natural materials (gas or wood) and a considerable amount of time. Therefore, the solar oven is much more energy efficient and time saving.

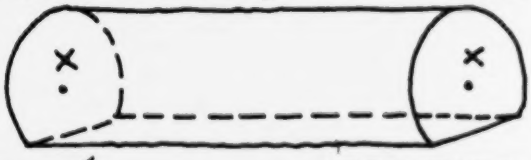
Explain to the students how the oven is made, or make the oven with the students. Demonstrate the use of solar energy by cooking hotdogs.

The sun is one of Iowa's potential sources of energy of the future. Although the sun sends abundant energy to the earth, collecting and storing that energy is a problem. You can make your own solar cooker to find out how useful the sun is.

A solar cooker uses the energy of the sun to cook food. It does this by reflecting the sun's rays and concentrating them on the food to be cooked. You can make a simple solar cooker by following the directions below. Remember, you must use your solar cooker on a sunny day.

Directions for Solar Cooker:

1. Locate the center on both ends of an oatmeal carton. Mark a point halfway along the radius on both ends and punch a small hole there.



2. Cut the carton in two parts.

3. Line the inside - including the ends - with foil. Have the shiny side showing. Keep the foil as wrinkle-free as possible. A dull instrument such as an ice scraper works well. Fasten the foil with rubber cement.

4. Make a skewer from a hanger. Put a hotdog on it and set your solar cooker in the sun. (Use a shoebox for a stand)

Where do you place your cooker in relation to the sun?
How long does it take the hotdog to cook?
What is the best time for solar cooking?

FAST (Energy-Efficient) FOODS

SUBJECT Home Economics
Foods

LEVEL 6 - 12

ACTIVITY IN BRIEF

Students determine and use the most energy-efficient method of preparation of a vegetable.

OBJECTIVE

Each student will be able to propose and justify reasons why his/her method of fixing vegetables is the most energy efficient.

MATERIALS

raw vegetables
foods laboratory

TIME

2 hours

LEARNING CYCLE

AWARENESS - Place a raw vegetable (carrots and corn-on-the-cob work best) in the center of each table and have students write down the type of food preparation that uses the least amount of energy (solar, electric, fire, human energy, etc.)

CONCEPT DEVELOPMENT - Compare answers. Then brainstorm as a large group, all the possible ways of preparing this food for consumption. Remind them that this vegetable may be prepared alone or with other foods to save energy (casserole, salads, etc.) May show film/filmstrip about preparation of vegetables.

APPLICATION - Each group of students use the method they identified as using the least amount of time and energy to prepare their foods. Compare cost, time, and energy with other kitchens.

EVALUATION - Students write an evaluation of their proposal and cite evidence that leads to energy efficiency.

FOLLOW-UP/BACKGROUND INFORMATION

Films and filmstrips from Tupperware, and Extension Service.

SOURCE OF ACTIVITY

Viki Van Ryswyk, Council Bluffs, Iowa.

ACTIVITY

Given a raw vegetable, students should examine ways of preparing the food for consumption based on low energy and cost.

Students should be aware of all possible methods of vegetable cookery.*

1. cleaned, raw
2. peeled, raw
3. shredded, cut up
4. steamed
5. baked
6. stewed
7. broiled
8. fried
9. sauteed
10. microwaved
11. stir fried
12. barbecue
13. solar cooked
14. deep fat fried
15. pureed

* See textbook for definitions if necoesary

Students choose the method they feel is least expensive, and saves the most energy (human energy, time, electricity, etc.)

Compare time, cost, and energy use with other groups.

WHAT MAKES POPCORN POP?

SUBJECT Home Economics
Foods

LEVEL 6-8

ACTIVITY IN BRIEF

Students will use popping corn and boiling water to see how energy can be changed (converted) from one form to another to make it more useful.

OBJECTIVE

Each student will be able to describe conversion of energy.

MATERIALS

TIME 1 hour

magnifying glass, popcorn popper, popcorn, cooking oil, (a ready-to-pop container of popcorn simplifies the activity.)

LEARNING CYCLE

AWARENESS - Give the students a popped kernel, a heated unpopped kernel and an unheated kernel of popcorn. Use a magnifying glass to examine the popcorn carefully. Record your Observation. How are the kernels alike: How are they different?

CONCEPT DEVELOPMENT - When one form of energy changes to another form, it is called conversion. Pop some popcorn and you will witness conversion taking place. Discuss what makes popcorn pop. (Using a glass pan would make popping the corn more interesting.)

APPLICATION - Since you cannot actually see the changing of moisture to steam within the kernels, boil water in a glass pan or coffee maker. Add food coloring and observe what happens. Have students answer questions concerning energy conversion. Have students write a paragraph explaining how conversion takes place.

EVALUATION - Have each student describe in writing how energy is converted relating two examples other than the class activity.

FOLLOW-UP/BACKGROUND INFORMATION

While considering the uses of steam, you may want to introduce geothermal energy. The earth contains natural steam underground which, in some parts of the world, can be tapped. Iceland and New Zealand are two countries that make extensive use of this clean and inexpensive energy source.

As an extra project, students might find out what James Watt had to do with the steam engine.

SOURCES OF ACTIVITY

Minnesota Department of Education, Minnesota Energy Agency, Series E, card 5. Adapted by Viki Van Ryswyk.

ACTIVITY

Looking at and comparing the three different forms of popcorn is meant to stimulate thought about steam as a source of energy and interest students in carrying through the learning activities.

When one form of energy changes to another form, it is called conversion. Pop some popcorn and you will witness conversion taking place. Fresh kernels of popcorn have moisture inside them. When these kernels are heated, the moisture turns to steam. The hard covering keeps the steam from escaping until the pressure becomes so great that the kernel pops (converts) into food we can eat. There will probably be a few unpopped kernels in the bottom of the popper. Compare a popped kernel with a heated but unpopped kernel and an unheated kernel. Use a magnifying glass to examine the popcorn carefully. Record your observation.

Popping corn is an interesting activity that provides visual demonstration of conversion. One shortcoming of the activity is that the changing of moisture into steam within the kernels cannot be observed. The activity is primarily to introduce the word "conversion" and should be followed up by the activity involving the boiling of water. Here the students see that not all the heat energy is being converted to steam. This leads them to understand that conversion involves heat, motion, light, and sound.

SCRATCH AND WIN?

SUBJECT Home Economics
Foods

LEVEL 6-12

ACTIVITY IN BRIEF

Students will make individual pizzas from scratch and compare the cost and energy to that of a similar frozen convenience pizza.

OBJECTIVE

Each student will be able to explain how many resources are depleted in quantity and quality in the name of convenience; that choices between essential needs and non-essential desires are often at conflict; that individuals can extend resource life by careful management.

MATERIALS

advertisements from food stores
foods laboratory
recipe books

TIME

3 hours

LEARNING CYCLE

AWARENESS - Ask students to make a list of their family's favorite convenience foods. Look up these foods in local food store advertisements and record weight of the packages, number of servings each provides, and current prices for the quantity specified.

CONCEPT DEVELOPMENT - After comparing lists, determine which food could be prepared at home using the basic ingredients. From these, choose one which can actually be prepared in class for comparisons in cash outlays for equivalent servings as well as comparisons on overall quality and nutritional differences (if any) of the convenient vs. "scratch" prepared item.

APPLICATION - Students prepare the food item from "scratch". Individual pizzas work very well for this activity. Ingredients can usually be found at home without added expense and time. Compare energy, time, cost with that of frozen pizzas.

EVALUATION - Have students make a chart comparing cost, quality, time, and energy used between the food made from scratch and the convenience food. Each student analyze and describe citing evidence when they may be justified in choosing convenience over scratch, and homemade over convenience.

FOLLOW-UP/BACKGROUND INFORMATION

Follow-up by having students answer questions provided.

Have them research the kinds of energy and materials used in processing and packaging the convenience foods.

Have students look through recipe books and list other foods that may be cheaper made from "scratch" than purchased convenient.

SOURCES

IDEA'S p. 311, Convenience & Energy, 1973, adapted by Viki Van Ryswyk.

SCRATCH AND WIN?

ACTIVITY

Ask each student to check at home or the local supermarket for processed convenience foods that are family favorites. The student should list three or four items, weight of the packages, number of servings each provides, and current prices for the quantity specified. This information may be collected from newspaper advertisements ahead of time

Tabulate these lists during classtime to determine the most often-used items. Determine which of them could be prepared at home using the basic ingredients. From these, select two or three which can actually be prepared in class for comparisons in cash outlays for equivalent servings as well as comparisons on overall quality and nutritional differences (if any) of the convenient vs. "scratch" prepared items.

Prepare at least one of the foods suggested.

Some questions you may want to consider discussing are suggested below. Select one or more that correlate with the specific instructional emphasis in your class.

Questions:

1. Were costs of preparing the food at home higher or lower (per serving) than if these items were purchased ready-to-eat from the store?
2. Did you consider the energy cost of using your range and/or water? If not, approximately how much would this add to the cost? Helpful data is available from your local utility companies.
3. Should the time spent (preparing these foods at home[human energy]) be considered in your comparison? Explain.
4. What kinds of energy and materials are used in processing and packaging the convenience foods you have been discussing?
5. Do any of these represent resources which must be conserved?
6. Can any of these materials be re-used?
7. Make a final list of the food items you have decided could be prepared more economically at home.
8. Make another list of food items that require no special preparations at all. Add an asterisk in front of those that can be raised on Iowa farms or gardens.
9. Identify all the energy inputs required to get our favorite processed food to you vs. the energy input required for putting an item from #8 into your diet.

WHAT'S FOR DINNER?

SUBJECT Home Economics
Foods

LEVEL 6 - 8

ACTIVITY IN BRIEF

Students will be asked to compare the types of preserved food available today with what was available 150 years ago.

OBJECTIVES

Each student will be able to 1) state how methods of preserving foods have changed over the last 150 years, 2) explain the impact energy/technology has on food preparation, and 3) describe one method of preserving food without electrical energy.

MATERIALS

pioneer resource books, pictures of preserved foods (optional), typical preserved foods (optional).

TIME

2 - 3 class periods

LEARNING CYCLE

AWARENESS - Have students imagine that they are a member in a family of pioneers. It is 1836 and they, along with a brother or sister (partner from class), are packing a covered wagon in preparing for a journey from St. Louis to the "West". Students should list types of food they would pack and give reasons for their choices. Pioneer choices should be based on availability, endurance, spoilage rate, cost, nutritional value, etc. Typical choices would include grains, salt beef (jerky), hard tac, and dried fruits and vegetables.

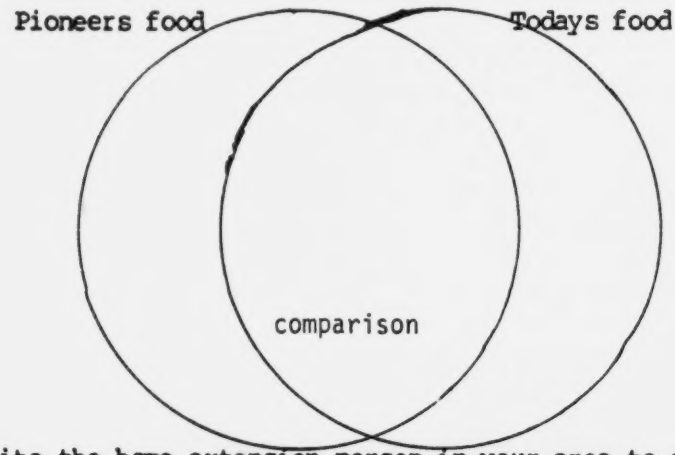
CONCEPT DEVELOPMENT - Given a list of preserved foods today OR provided with actual preserved foods OR looking at a display of pictures of preserved foods, the students will determine which foods would be possible choices for the pioneers.

APPLICATION -Divide into small groups. Each group develop a method pioneers could use to preserve food in their trek westward (no electricity). Have students present their ideas back to the large group. Keep a list of pioneer food. Make a Venn diagram comparing and contrasting differences between pioneer's food list and modern preserved foods.

EVALUATION - Have students state methods of preserving foods, both old and new. Explain how energy use has changed food preservation. Describe one method of preserving food without the use of electricity.

FOLLOW-UP/BACKGROUND INFORMATION

Venn diagram:



1. List contrasting characteristics on outside circles.

2. List comparisons inside overlap.

Invite the home extension person in your area to address the class on home preservative techniques, new methods of preserving food, or ranking preservation techniques by nutritional impact.
Taste typical pioneer foods such as jerky, hard tac, and dried fruits.
Design and/or build a portable fruit dryer.

SOURCES

Richard Delagardelle, Anamosa West Middle School, adapted by Larry Read

HOW NOW, DRY COW!

SUBJECT Home Economics
Foods

LEVEL 9-12

ACTIVITY IN BRIEF

Students will compare different kinds of milk to determine the cost of the milk related to production and energy use in production.

OBJECTIVE

Each student will be able to relate energy use in production with the cost of the end product, and calculate what forms of milk, or other foods, are the least expensive.

MATERIALS

Different kinds of milk in original packaging

TIME

2 hours

LEARNING CYCLE

AWARENESS - Have students brainstorm as many forms of milk that can be purchased, and describe the packaging and processing used for each. (They may need to guess) Then give them examples of all the kinds of milk and have them write down everything they know about that milk from touching, looking, and reading.

CONCEPT DEVELOPMENT - Discuss energy involved with processes used to prepare the types of milk. Show filmstrip/film on milk preparation and purchase.

APPLICATION - Check prices of canned, fresh, and dried milk at your local grocery. Be sure to note unit size and weight as well as price. Fill in data table and answer questions.

EVALUATION - Have students choose a food product that can be purchased in many different forms (fresh, canned, dried, frozen, microwavable, convenient) and make a chart evaluating the processes involved in production and cost of each.

FOLLOW-UP/BACKGROUND INFORMATION

Bringing food to our table means using energy over and over again. How much energy is consumed in producing and delivering any one commodity varies greatly. Each step in the processing chain costs energy, and as the cost of energy has grown to be appreciable, that expense is becoming reflected in grocery store prices.

The energy in an essential food like milk came from the sun. It stimulated the growth of plant fodder for the cow who transformed and concentrated some of that stored energy into milk. Getting that milk from the cow to your kitchen usually involves much more energy, amounts depending on the route followed. Milk can be bought in several forms. Fresh milk is usually packaged in waxed paper cartons or in plastic jugs. Evaporated milk is offered in cans. Dried skim milk is usually packaged in foil-lined paper boxes. How much does each of these types of container hold? How many containers are necessary per gallon of milk? Which kinds "cost" the most energy? (See the accompanying chart: Amount of Energy Required to Process Some Common Materials)

Processing each form of milk (fresh, evaporated, dried) requires energy. All milk is pasteurized, a process requiring heat to kill dangerous bacteria. Evaporated milk is not only pasteurized but also is heated further until half of its water content is gone; then it is heat-sealed into cans. Drying milk to powder or granules also requires considerable energy, but the loss of water means loss of weight, so packaging and transportation costs are reduced. Loss of water also stops common bacteria from living on the milk, so energy-expensive storage (refrigeration) is unnecessary. Fresh milk must be refrigerated constantly.

Transportation of milk costs additional dollars and is often proportional to weight. As energy prices soar, the processing, packaging, storing, and transporting costs of marketing milk will also increase.

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*To bring canned milk to the equivalent of fresh, multiply by 2. To bring dried skim milk to the equivalent of fresh, multiply by 10. (4 lbs. dry milk + 36 lbs. water = 40 lbs. or 5 gallons of fluid milk.)

SOURCE OF ACTIVITY

IDEAS p. 257
Developed by Viki Van Ryswyk

HOW NOW, DRY COW!

ACTIVITY

Students brainstorm all forms of milk and what they know about processing of the different forms. Then give them samples to examine. Have them write down everything they learned from these new observations.

Present information about the forms of milk available. Films and filmstrips from the American Dairy Association and Tupperware may be used.

Check prices of canned, fresh, sweetened condensed, evaporated, and dried milk at your local grocery. Be sure to note unit size and weight as well as price. Fill in the following data table:

Milk Type	Price	Unit Size	Unit Weight	Equivalent Fluid volume	Price/ Gallon
fresh					
canned					
dry					

Questions:

1. Which type of processed milk cost most?
2. What were the energy inputs contributing to this cost?
3. Which type of milk cost least?
4. Give at least one reason why this type is less expensive.
5. List an advantage and a disadvantage of each of the processed milks.
6. How could some of the energy consumed in processing milk be provided directly by the sun? Try to suggest at least one possibility.

Amount of Energy Required to Process Some Common Materials

Material	BTU X 10^6/ton
Crushed Stone	0.1
Wood	0.3
Brick	6.9
Cement	12.4
Flat Glass	18.1
Iron Casting	25.0
Lead	31.1
Paperboard	36.4
Paper	40.6
Steel Casting	46.7
Steel: carbon, cold-rolled	52.7
Aluminum:rolled, forged, cast	75.0
Zinc, rolled	79.2
Copper: wire	106.2
Copper: rolled	128.0
Nickel	374.7
Tin	469.3
Polystyrene (a plastic)	22,600.0

(Data for this table is from Patterns of Energy Consumption in the United States, U.S. Office of Science and Technology, January, 1972.)

GO DRY UP!
Drying Foods

SUBJECT Home Economics
Foods

LEVEL 6-12

ACTIVITY

In this activity, you will use low-cost household materials to build a solar food dryer. This dryer will preserve foods that are nutritious, delicious, and just right for a fast-paced, mobile lifestyle.

OBJECTIVE

At the completion of this activity, each student will be able to 1) construct a low cost, lightweight, portable solar food dryer from household materials, 2) list the advantages/disadvantages of preserving food by solar drying, 3) preserve fruits and vegetables according to solar food drying principles, and 4) evaluate the dried food for taste and texture.

MATERIALS

TIME

6 days

1 dark colored plastic dishpan
1 roll of plastic canvas
1 large piece of clear plastic (a dry cleaner bag works well)
1 roll of duct tape, 1 sharp knife, 1 ruler, 1 large rubber band, thermometer, fruits and vegetables.

LEARNING CYCLE

AWARENESS - Ask the students to name the kitchen appliance which fits this description: "What is easy to use, produces no waste, can be used year round, requires no chemicals, and costs nothing to operate?" Discuss all the answers given, and how they may not fit every characteristic in the description. The answer of course, is a solar food dryer. (See activity for reference.)

CONCEPT DEVELOPMENT - Discuss how a solar food dryer can prepare food efficiently at the same time it promotes good health and wise energy use. May go through background information with students. Use low-cost household materials to build a solar food dryer.

APPLICATION - Preserve fruits and vegetables using the solar food dryer. Follow the recipes for solar dried foods as detailed on Worksheet A. List advantages/disadvantages of using a solar food dryer and evaluate the taste and texture of solar dried foods by completing Worksheet B.

EVALUATION - Construct a solar dryer according to handout. List the advantages/disadvantages of preserving food by solar drying. Each student participate in preparation of drying food and each complete the evaluation form (Worksheet B).

FOLLOW-UP

Use solar energy to dry fruit that requires sulfuring as a pretreatment process. Research the process and identify fruits which benefit from sulfuring in terms of preserving color, flavor, and nutrients.

Find and follow a recipe for producing fruit leather from pureed fruit. Solar dry the pureed fruit.
If you live in a very sunny, dry climate, prepare solar dried meat jerky from a tested recipe.

Prepare a meal using solar dried fruits and vegetables as substitutes for fresh, canned, or frozen products.

Solar dry herbs for classroom cooking use.

Use solar dried foods on a camping trip.

Research and make a chart comparing the shelf lives of solar dried foods to fresh, frozen, or canned foods.

BACKGROUND INFORMATION

Drying is both the most ancient method of food preservation and one that remains popular today. More recently developed preservation processes include canning, freezing, the use of preservatives, and irradiation.

Solar food drying is a highly effective way of preserving the energy plants store as nutrients through the process of photosynthesis. One thousand year old kernels of corn recently found in dry sand in a constantly cool New Mexico cave, for example, germinated when planted.

Food drying results in the loss of free water, which effectively protects the food from decay by microorganisms. The nutrients are preserved and the concentrated material has enduring quality. Food drying may be achieved by two processes: naturally by sun drying, or artificially by passing warm air over the product. In either process, as dehydration progresses, air circulation is needed to carry away moist air and to provide warm, dry air which can absorb additional moisture.

Dried foods will keep a minimum of one year if properly prepared. Foods must be dried to a 5% moisture content or lower for them to store well. They should be stored in a cool, dark place. Many dried foods can be kept for as long as four years, which is double the recommended storage time for canned foods. Dried foods are reduced in weight and bulk, an advantage in packing provisions for hiking and camping.

Foods may be solar dried for many reasons. Solar drying is economical and conserves the fossil fuel energy that other forms of preservation require. Solar drying is especially energy conserving when you consider that the food processing industry consumes 12 times more energy in preparing food for the table than the food contains. Also, with many people today worrying about the side effects of the preservatives used by the food processing industry, solar drying allows the individual to retain control over the food consumed. Solar dried foods are wholesome; no preservatives are required for a long shelf life and there is little nutrient loss from the food.

Many fruits are recommended for sun drying: apples, apricots, cherries, citrus peels, shredded coconut, currants, dates, figs, grapes, nectarines, peaches, pears, pineapple, and plums. Recommended vegetables include onions, green peppers, chili peppers, corn, lentils, peas, shell beans, and soybeans. Pretreatment by steaming may be required to kill microorganisms, stop certain chemical processes, preserve color, check the ripening process, preserve the vitamin and mineral content, or break down outer tissue so moisture escapes from inner cells more rapidly. The water content of fruits and vegetables may be very high. Apples and grapes, for example, have water contents of 84% and 81%, respectively.

Vegetables are dry when they are leathery or brittle. Fruits are dry when they are leathery and pliable. If in doubt, it is better to overdry than underdry.

The advantages of solar drying include retention of the food's nutrient value, economy, a long shelf life, minimum packaging, reduced weight and bulk, absence of artificial preservatives, and conservation of fossil fuel energy.

The disadvantages of solar drying include increased human effort and time in preparing the food for drying, variability of sunshine and humidity, and a product taste consumers may not be used to.

LOOKING BACK

Although solar food drying is an ancient method of preservation, it is still effective for keeping food from spoiling until you're ready to use it. For best results fruits and vegetables of high quality should be selected for drying. To quickly remove moisture, the prepared food is exposed to direct sunlight during daylight hours for several days. This is followed by several days in a shaded area, where evaporation is completed. The shelf life of solar dried food in air-tight packaging is greater than that of canned or frozen foods.

A solar food dryer can be constructed for a minimum cost, using available household materials. This portable appliance stores easily and costs nothing to operate.

SOURCE OF ACTIVITY

U.S. Department of Energy, Solar Energy Education, March 1981, adapted by Viki Van Ryswyk.

ACTIVITY.

What is easy to use, produces no waste, can be used year round, requires no chemicals, and costs nothing to operate? This may sound like a riddle, but it's actually a description of a solar food dryer. In a society that emphasizes the importance of "fast foods", this household appliance can prepare foods efficiently at the same time it promotes good health and wise energy use.

Several warm, sunny days will be needed to accomplish the solar drying. Late spring and early fall days are especially good drying times, as humidity levels tend to be low while the sun's rays remain warm.

Select fully ripe, in-season fruits and vegetables for drying as these will yield the best results.

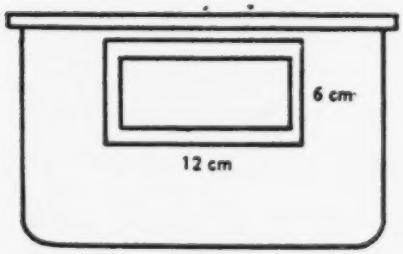
Using the sun's energy to remove moisture from fruits and vegetables is an inexpensive way to preserve them. Sun drying was used as a method of preserving long before we had refrigerators. Much of today's dehydrated food is used by campers and those concerned with limited space, long-term storage and lightweight foods.

How to Prepare Food:

1. Use clear, fresh fruits. Slice them very thin, (they'll dry faster), usually 1/4" thick.
2. Certain fruits (such as bananas, apples, peaches) turn brown with exposure to air. To keep these foods from turning brown, dip the slices in equal parts of lemon juice and water.
3. Place the food slices on the shelves so they don't touch and put the box outside in the sun.
4. Be sure to turn the pieces over at least once a day, so they dry evenly.
5. It may take 2-3 days in the sun to dry the food. Fruit is leathery when dried completely.

Collect the materials to construct the food dryer. Construct as follows:

Diagram 1



PROCEDURE

1. Assemble the materials for the solar food dryer.

2. On each end of the dish pan, cut out a rectangle that measure 6cm x 12cm. (See Diagram 1.)

3. Cut two pieces of gutter mesh that measure 10cm x 16cm.

4. Place a piece of the cut gutter mesh over each opening in the dish pan. Tape each piece of mesh in place with duct tape. (See Diagram 2.) The resulting vents will provide air circulation through the solar dryer.

5. On each long side of the dish pan, cut three slits, equal distances apart, to hold the dryer shelves. The slits should be 1cm high and slightly wider than the width of the mesh. (See Diagram 3.)

6. Cut three pieces of mesh 4cm longer than the width of the dish pan. These will serve as dryer shelves.

7. Stretch each mesh piece between each set of slits, pushing the ends of the mesh through the slits. Pull taut and fasten to the outside of the dish pan with duct tape. (See Diagram 4.) To keep out insects, make sure that the duct tape covers the slit completely.

8. From Worksheet A, choose one recipe for solar drying a fruit or vegetable. Prepare the food for drying according to the recipe.

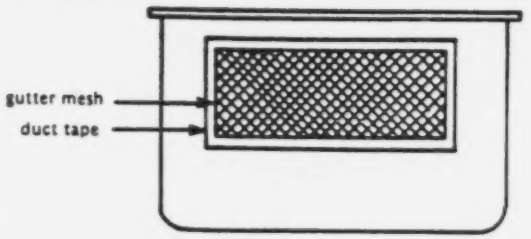
9. Place the prepared food on the shelves of the dryer. Leave air spaces between the pieces of food.

10. Place the thermometer in the bottom of the dryer so that it faces the opening.

11. Cover the open side of the food dryer with a piece of plastic. Stretch the plastic tightly across the opening. Hold it in place by hooking a large rubber band over the rim of the dryer. (See Diagram 5.)

12. Place the dryer in direct sunlight, with the opening facing the sun. Turn the food two or three times each day. The idea is to remove moisture as quickly as possible to prevent spoiling.

Diagram 2



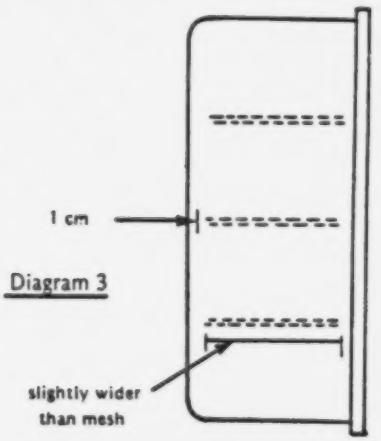


Diagram 3

Diagram 4

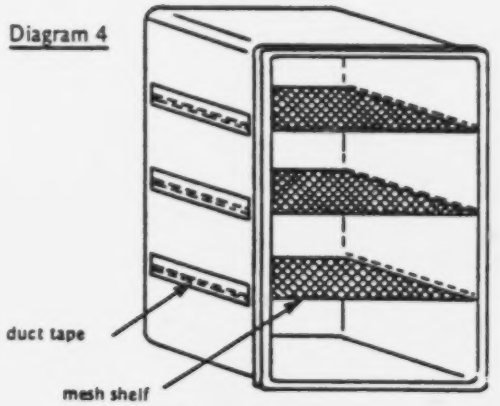
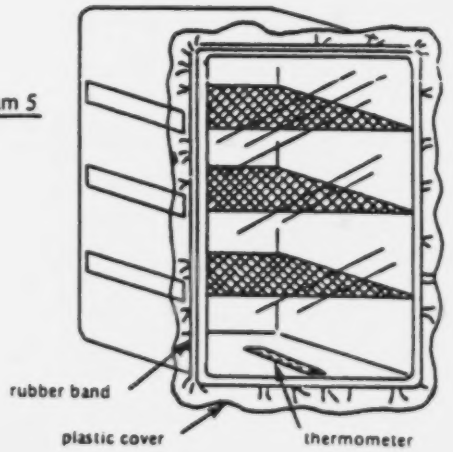


Diagram 5



13. Check the temperature inside the dryer often. If too high a temperature is maintained, the surface moisture evaporates from the food too quickly. This causes the outer shell to harden and prevents the escape of moisture from the interior of the food. If temperatures inside the dryer go above 60°, move the dryer out of the direct sunlight.

    Caution: If you are drying the foods outside, bring the dryer inside at night and during periods of rain and high humidity. In the morning do not place the dryer outside until dew or rain has evaporated.

14. After several days continue the drying process in the shade. Your teacher will tell you when your food has reached the desired degree of dryness.

15. Use Worksheet B. to evaluate the results of your solar drying.

QUESTIONS

1. Which foods dried the best? The worst?

2. Which food tasted best dried? Worst?

3. What different kinds of textures did the dried foods have?

4. What are the advantages of using the sun to dry foods? The disadvantages?

5. Which advantage of solar dried food is most beneficial to the consumer? Why?

6. What qualities should foods have to be selected for solar drying?

WORKSHEET A

RECIPES FOR SOLAR DRIED FRUITS AND VEGETABLES

The highest quality food should be chosen for drying. Select fully ripe but not mushy fruit or vegetables.

Grapes: Thompson seedless grapes dry best but Sultanas can also be used. Four and a half pounds yield 1 pound of raisins. Leave the grapes on the stem; wash and dry them. Pretreat by steaming 30 seconds to 1 minute or until the skins crack. Protect the grapes from excess humidity, which causes crystallization. The grapes are dry when they are leathery, with no pockets of moisture.

Apples: Tart varieties such as Gravenstien, Granny Smith, Jonathan, Newton, and Rome Beauty are usually preferred for drying. The apples should be ripe but free from bruises or soft spots. Wash, peel if desired (skin tends to be tougher when dried), core, and slice into 5mm pieces. The apples are dry when they feel pliable to crisp.

Onions: White varieties have the best dried flavor. Onions should be firm, heavy for their size, and aromatic. Trim the bulb ends and remove the paper shell. Slice 3mm to 8mm thick. The onions are dry when they feel like paper.

Peppers: Both green and red peppers can be dried. Choose fresh, firm, well-shaped peppers with thick walls. Chop or thinly slice the peppers. The peppers are dry when they feel tough to brittle.

Bananas: Purchase overripe, "reduced in price" bananas. Slice the bananas directly onto the drying shelf without overlapping the slices. The slices will not stick to the tray once they are dry.

Plums: To produce good quality prunes, cut the plums into small pieces to speed the drying process. Lay the plums skin-side down on the shelf and dry in strong, direct sunlight.

Pineapple: Select golden, slightly soft pineapples. Wash the outside thoroughly, to the point of scrubbing. Peel the pineapple, then slice crosswise into 1cm. portions. Remove the core.

WORKSHEET B

There are many ways to judge food, but two of the most important are the food's taste and texture. Without sharing your opinion with your teacher or any classmates, rate the fruits and vegetables that were solar dried.

Food	Taste			Texture
Grapes (raisins)	not very tasty	average	tasty	delicious
Apples	not very tasty	average	tasty	delicious
Onions	not very tasty	average	tasty	delicious
Peppers	not very tasty	average	tasty	delicious
Bananas	Not very tasty	average	tasty	delicious
Plums	not very tasty	average	tasty	delicious
Pineapple	not very tasty	average	tasty	delicious

If you do not like the fruit or vegetable served plain, try using it in a recipe, such as cookies or spaghetti sauce. Then rate the dried fruit again.

Store any remaining food in one of the following ways:

1. Place the food in a jar and cover the top with plastic wrap. Screw the lid on tightly over the wrap. The wrap will make the jar even more airtight.

2. Place the food in zip-lock bags. Close the bag until only a soda straw can be inserted through the remaining opening. Suck out the remaining air without breathing into the bag. Remove the straw and finish sealing the bag.

To increase the length of time packaged foods can be stored, keep them in a dark, cool place.

BURNING CALORIES!

SUBJECT Home Economics
Foods

LEVEL 6 - 12

ACTIVITY IN BRIEF

Students increase their awareness of the energy in foods by calculating the energy they consume in class.

OBJECTIVE

Each student will be able to calculate the amount of calories in common food items and the amount of and type of exercise needed to burn the calories.

MATERIALS

many pieces of food
(M & Ms, raisins, nuts)

TIME

1 hour

LEARNING CYCLE

AWARENESS - Start the activity by asking energy related questions and rewarding each student that answers with 1, 2, or 3 pieces of food. Suggested questions listed under BACKGROUND INFORMATION. Try to ask enough questions so each student has at least one piece of food. Do NOT let the students eat the food until later.

CONCEPT DEVELOPMENT - After distributing all your food rewards, give the students time to "swap" their food. They may want to trade colors, trade raisins for M & Ms, peanuts for chocolate chips, etc. Give them a 30 second time limit. Before eating the food reward, have students record how many of each they will consume. Students may now eat their food.

APPLICATION - After eating the food rewards, have the students calculate how many calories they ate and how much exercise they need to perform to burn the energy from the food they ate.

Have all students stand and do an exercise to burn the food energy they ate. When they burn all the energy, they may sit down. Those students who ate the most high-calorie foods will remain exercising longer.

Discuss calorie content of popular foods. Compare high calorie foods with low calorie foods, junk food with nutritious foods.

SUGGESTED EVALUATION - Have students plan a well-balanced days' diet; 3 meals plus 2 snacks. Have students compute the total daily intake of calorie energy and propose an exercise schedule to burn all the energy for the day.

FOLLOW-UP/BACKGROUND INFORMATION

Suggested questions:

How many of you walked to school today?
How many of you car pooled with at least 3 other people?
Who used a wind-up alarm this morning instead of electric?
How many took a quick shower instead of a deep bath?
How many let their hair air-dry instead of blow-drying?
How many of you open your windows instead of running the air conditioner?
How many of you ate breakfast at home instead of eating out this morning?

Note: All questions are energy related. Give students the food reward you feel appropriate for responses that save energy. You may make up your own questions to fit your class situation. Try to ask enough questions so every student has at least one food reward.

Have students calculate the number of calories in their food reward. To do this, follow these steps:

1. Record the total amount of calories in one package of M & Ms, peanut M & Ms, raisins, and peanuts.

2. Get an average of the number of pieces in each package by counting about 4 packages and dividing by the number of packages.

3. Divide the total number of calories by the average number of pieces.

4. Record on the board the amount of calories in <u>one</u> M & M, peanut M & M, etc.

5. Have students complete figuring their total calorie intake using simple multiplication.

Total calories may be rounded off for convenience. Have students exercise to burn the calorie energy of their food reward.

The chart on the next page can be used for your own figuring.

For your convenience, you may consider using the following: five "jumping jacks" per M & M, 10 for peanut M & Ms, and only two for the raisins.

SOURCE OF ACTIVITY

Developed by Viki Van Ryswyk. Chart from 1985 copyright, 5th edition Sue Rodwell Williams "Nutrition and Diet Therapy" <u>Times Mirror/Mos</u> by College Publishing.

CHART:

Activities: Calories/Min.	Light 2	Light/Moderate 2.5 - 5.0	Moderate 5.0 - 7.0	Heavy 7.0 - 10.0
	Personal care Dressing Washing Shaving	Domestic work Making beds Sweeping floors ironing light gardening	Yard work digging pulling weeds mowing lawn	Yard work chopping wood digging holes shoveling snow
	Sitting rocking typing writing playing piano	Light work auto repair printing washing car	Walking 3 1/2 - 4 mph level up/down small hills	Walking 5 mph upstairs up hills climbing
	Standing or slowly moving around	Walking 2-3 mph on level		
		Recreation archery bicycling 5 1/2 mph bowling canoeing 3 mph	Recreation badminton calistehnics canoeing 4 mph dancing golf (no cart) ping pong tennis (doubles) volleyball	Recreation bicycling 12 mph (hills) cross country skiing jogging (5 mph) swimming tennis (singles) water-skiing

HE-41

LET'S PLAY!

Toy Safety

SUBJECT Home Economics
Child Development

LEVEL 11-12

ACTIVITY IN BRIEF

The student will be able to evaluate the purposes, characteristics and safety of toys and play equipment for children.

OBJECTIVE

Each student will be able to evaluate young children's toys, comparing those toys which require outside energy sources to those that require only human energy.

MATERIALS

Poster board
Magazines
Catalogs
Scissors
Glue

TIME

1 class period

LEARNING CYCLE

AWARENESS - Divide students into small groups. Give each group a toy to play with. Do not give them energy sources to use with the toys (no batteries, electricity). Tell the students they may "play" with their toys for 10 minutes. Some of the toys given will require human energy such as muscle involvement, creativity, safety, etc. The students with the "energy using toys" will soon realize they have toys that don't work. They may come up with alternate ways of playing with these toys. Suggestions for toys include; building blocks, play dough, puzzles, paper dolls and clothes, pick-up stix, tiddly winks, battery operated car, electronic game, battery robot, etc. Remember, no batteries!

CONCEPT DEVELOPMENT - Ask students if they could tell a difference between the types of toys distributed (energy difference). Compare toys that use non-human energy vs. human energy. In small groups using magazines and catalogs, each person should select pictures of two toys that use some type of energy and two toys that need only a child's energy. Mount the pictures on poster board dividing the toys into groups - those that <u>do use energy</u> and those that <u>do not use energy.</u>

APPLICATION - Select two toys that are for a similar age--one that needs energy and one that does not. Each group should discuss the toys. Rank with a 5 if there is a great deal of muscle involvement, creativity, safety, cost, and

stimulation involved. If no muscles are involved, no creativity, etc., then give the toy a rank of 0. You may use the numbers 4,3,2, and 1 for amounts in between. Discuss the toys and make a composite chart for your group. Answer the following thought questions: 1) What conclusions can you draw from this activity? 2) Which toy is best for the child's development? Why? 3) Is this a practical way to conserve energy?

EVALUATION - Have students create toys for children which have these qualities: 1) stimulates creativity; 2) uses energy (muscle involvement); 3) safe; 4) low cost; 5) educational. Include a written explanation of toy and how it meets the above criteria.

FOLLOW-UP/BACKGROUND INFORMATION

Value of Play to a Young Child

—outlet for excess energy

—development of all parts of the body bones, muscle, internal organs

—exercise which promotes good appetite and healthful sleep

—development of many skills which will prove to be useful throughout life

—development of ability to concentrate on task at hand

—outlet for pent-up anger, jealousy and fear

—learning to get along with other children

—learning to conform to wishes of others

—learning to cooperate and share

—learning to be a good sport and a good loser

—learning to conform to rules

Characteristics of Good Play Equipment

—offers opportunities for a variety of play activities

—suited to the child's age and level of development

—can be manipulted without adult help

—safe, regardless of how the child uses it

—offers opportunities for play with other children

—can be used indoors or outdoors

—appeals to the child's taste in color

—stimulates the child's interest creativity

—belongs to the child and not shared by other children unless the child wishes

—small and light enough that the child can move it without adult help

—may develop large muscle coordination, small muscle coordination, intellectual, speech, or social development in child

Refer to Child Development Curriculum dealing with play and the use of toys.

<u>Naturally Powered Old Time Toys - How to Make Sun Yachts, Sail Cars, a Monkey on a String and Other Moving Toys</u>. Marjorie Henderson and Elizabeth Wilkinson, Lippincott, 1978.

SOURCE OF ACTIVITY

Brenda Qualteri
<u>Energy Management Strategies</u>, Public Service Company of Colorado, 1982

CATCH A SUNBEAM

A Game for Young Children

SUBJECT Home Economics
Child Development

LEVEL 9 - 12

ACTIVITY IN BRIEF

Like adults, children too, need to learn how the sun affects their lives. In this activity you'll help young children understand how the sun aids in keeping them healthy. You'll also learn about one of the ways in which we teach young children.

OBJECTIVE

At the completion of this activity, each student will be able to 1) teach young children a game called "Catch a Sunbeam", 2) sew a bean bag to use in the game, 3) explain to young children how sunshine helps to keep the human body healthy, 4) state how the human body uses Vitamin D, 5) recognize that sunshine is a natural source of Vitamin D, and 6) identify Vitamin D-rich food.

MATERIALS

2 8" squares of yellow felt
yellow thread, a sewing needle,
scissors, dried peas, beans or
lentils, straight pins, magazines,
cardboard or tagboard.

TIME 3 class periods

One period to sew bean bags
One to receive Vitamin D
instruction & practice roles
as teachers and one period
to teach children.

LEARNING CYCLE

AWARENESS - Use the paper pattern of the sun (see worksheet) to cut out two layers from the yellow felt. Sew around the sun on the "sewing line" using a small running stitch and leaving a one inch opening on one ray. Fill the sun bean bag with dried peas or beans and finish sewing the last inch. As students are making this "sun", the teacher may lead a discussion on what it feels like to sit in the sun; what does the sun do for us; how does the sun keep us healthy? Cut pictures of Vitamin D-rich foods from magazines and mount them on cardboard or tagboard.

CONCEPT DEVELOPMENT - Prepare the students well for their role as teachers. Give them instructions on Vitamin D. Allow time to prepare a flashcard (with the term "Vitamin D" written on it) and pictures of foods rich in Vitamin D. Have them practice what they will say and do before they teach the game to the children. Allow different students to perform different sections of the game-part of the activity. Emphasize the importance of their teaching roles.

APPLICATION - Sit in a circle with all the children around the outside and the "teacher" in the center. Hold up "Vitamin D" flashcard and explain that when sunlight strikes our skin, Vitamin D is produced by our bodies. The teacher should then explain the function of Vitamin D. Show examples/pictures of Vitamin D-rich foods. Most of the vitamin was produced when the food was exposed to sunlight or ultraviolet light. Tell the children to close their eyes and imagine that they are the "sun", sending rays out to all the other children. Ask them to explain how Vitamin D can keep their bodies health and to tell the sources of Vitamin D. Have the students stand in a circle and listen to the directions for the game "Catch a Sunbeam". If possible play outdoors in the sunshine.

Choose one child to be the sun's messenger. The child should walk around the circle carrying the sun bean bag while other children chant:

"A sunbeam, a sunbeam, who will catch a sunbeam?"

The messenger drops the sunbeam behind any child in the circle. That child should pick up the sun and try to tag the messenger before he/she runs around the circle and reaches the empty space. If the messenger is tagged, he/she must take another turn. If the messenger safely returns to the space, then the child carrying the sun becomes the messenger and takes a turn. The game should continue until each child has a turn.

EVALUATION - Each student will 1) construct a bean bag; 2) state how sunshine enhances good health; 3) describe how the human bodty uses vitamin D; 4) prepare a poster listing and identifying foods that contain vitamin D.

FOLLOW-UP/BACKGROUND INFORMATION

Prepare a picnic or snack outside in the sun for the children. Choose a food or foods that are high in Vitamin D. Explain again how Vitamin D is produced. As the children play "Catch a Sunbeam", have the messenger call out a food that is a source of Vitamin D as the sun bean bag is dropped behind a player.

Take a large sheet of heavy cardboard and draw a picture of a house on the surface so that the entire sheet becomes a house. Cut out the doors and windows. Prop the cardboard against a wall. Have the children toss the sun bean bags through the doors and windows to collect points. This game can be played individually or in teams, and is a good way for children to gain skill in accurate throwing. The game can then lead into a discussion on the way sunshine enters a house and the benefits of passive solar design for homes.

Vitamin D is available to the body through two separate processes. The first process occurs when human skin is exposed to sunshine. Human skin normally contains a fat-related compound known as cholesterol, which can be converted through a complex series of chemical reactions into dehydrocholesterol. This compound is converted to Vitamin D when exposed to certain wavelengths of ultraviolet light (generally not those which cause sunburning). The most crucial factor in the production of Vitamin D is not the quantity of dehydrocholesterol in the skin but the availibility of the wavelengths of ultraviolet which trigger the conversion process.

Rickets is a disease in which bones do not calcify normally and teeth develop poorly calcified enamel. This disease can be prevented by proper amounts of Vitamin D. Vitamin D allows the absorption into the bloodstream of the calcium and phosphorus contained in food and the reabsorption of phosphorus in the kidneys. Rickets is a disease of the temperate regions of the earth, where there is much cloudiness, fog, and air-borne dust to filter out the ultraviolet rays of the sun. Heavy clothing and window glass will also filter out ultraviolet, further reducing the natural production of Vitamin D by the skin. Fortunately, rickets is becoming a rare disease, because there is a second method of obtaining Vitamin D — observing a proper diet.

Common foods contain little Vitamin D. Plants and animals, when exposed to sunlight, can also produce Vitamin D, but the amount in any prepared food will vary with the food's exposure to sunlight. Saltwater fish contain large amounts of Vitamin D, as do the livers (which can store Vitamin D) of cod, halibut, and sharks. Thus the importance of the famous cod-liver oil. Today many common foods are fortified with Vitamin D, by either feeding the vitamin to the animals or irradiating milk or breads with ultraviolet radiation from arc lamps. It should be noted that both methods of obtaining Vitamin D can be overdone. Excessive exposure to sunlight can cause skin cancers in some individuals, while overdoses of Vitamin D in foods can cause nausea, loss of appetite, and headaches, as well as a loss of calcium and phosphorus by the body.

SOURCE OF ACTIVITY

Adapted from N.Y.State Solar Curriculum, U.S. Dept. of Energy, Solar Energy Ed., March 1981, by Viki Van Ryswyk

CATCH A SUNBEAM: A GAME FOR YOUNG CHILDREN

This activity provides an excellent opportunity for students to work with young children in a child development program. It also allows students a chance to prepare materials and perform as teachers in providing instructions to youngsters.

Babies and young children need to develop strong bones and teeth. To do this, their bodies must produce Vitamin D, a substance which helps them to absorb and use the calcium and phosphorus contained in the foods they eat. One source of Vitamin D is sunlight. When the ultraviolet light in sunlight strikes us, a substance in our skin is changed to Vitamin D. No wonder Vitamin D is often called the "sunshine vitamin".

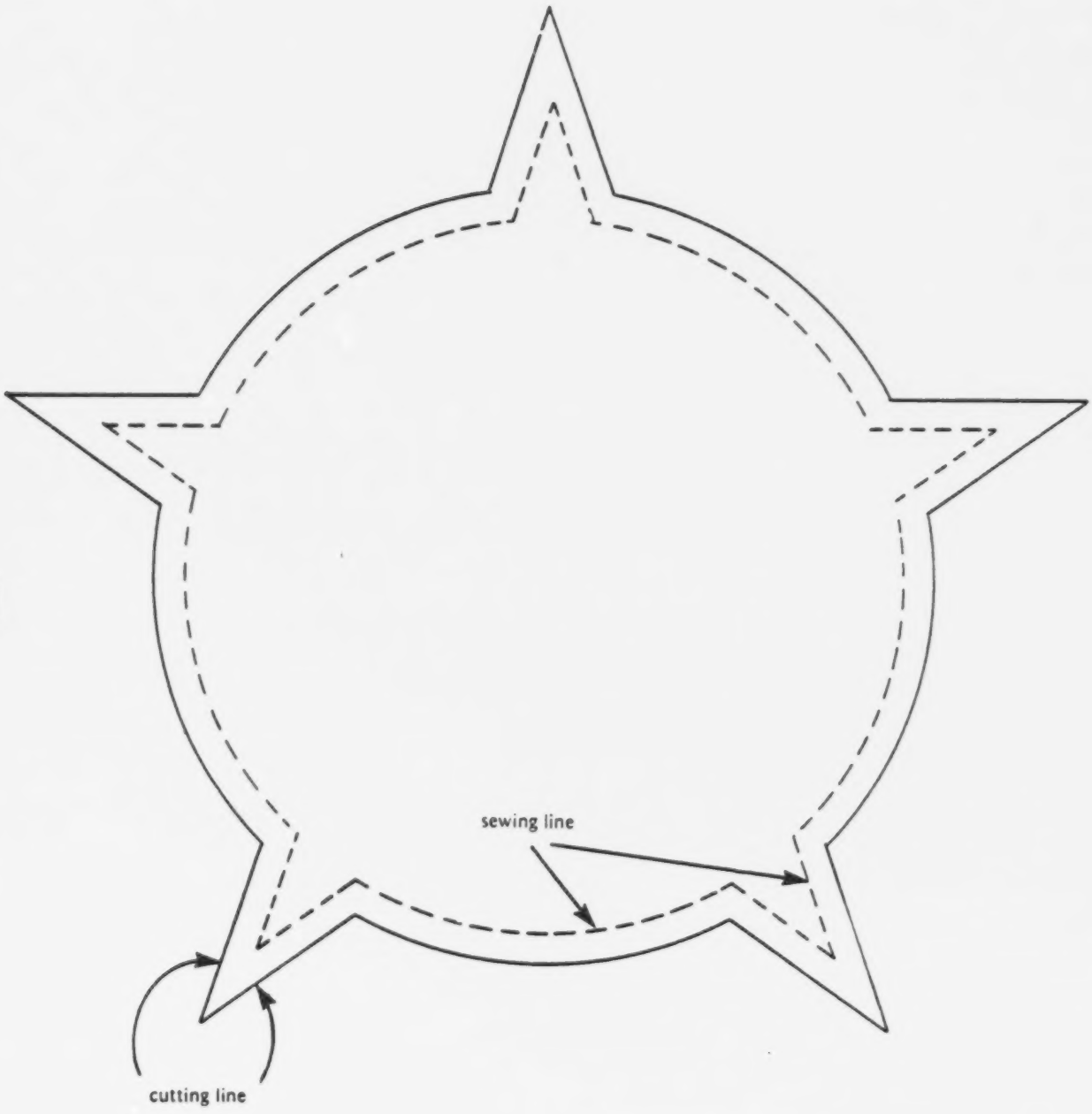
When people are exposed to the sun, a substance in their skin is changed to Vitamin D. When milk, grains, or even bread are exposed to ultraviolet light, similar substances are also converted to Vitamin D. When we artificially irradiate these foods with ultraviolet light, we are said to be "fortifying" them. These foods, as well as sunshine, are our best sources of Vitamin D. Vitamin D is especially important for building strong bones and teeth in young children.

Children learn through play. By playing a game in the sun, they have learned that their bodies need the sun's rays to stay healthy.

Discussion Questions:

1. What vitamin is made when sunlight touches the skin?
2. How is that vitamin produced?
3. Why is it necessary for babies and children to have the proper amounts of that vitamin?
4. What foods provide us with Vitamin D? How is Vitamin D produced in these foods?
5. Why is it a good idea to teach young children through games?
6. How does the body obtain Vitamin D during the winter or on cloudy days?
7. What foods have you eaten this week that have provided you with Vitamin D?
8. What are the dangers of overexposure to sunlight or overdoses of Vitamin D?

Worksheet
Making a Sun Beanbag



CLOTHING AND ENERGY

SUBJECT Home Economics
Clothing Selection

LEVEL 9 - 12

ACTIVITY IN BRIEF

To evaluate clothing selections on the amount of energy necessary to produce the fabric and discriminate between clothing care practices that are energy wasting and energy conserving.

OBJECTIVE

After completion of this activity, each student will be able to compare fibers in fabrics, considering the amount of energy necessary to produce the fabric and the amount of energy necessary to care for the fabric.

MATERIALS

TIME 2 class periods

garment tags, magazines and catalogs that show fashions, scissors, poster board, glue, markers

LEARNING CYCLE

AWARENESS - Today a wide variety of fiber blends and fabric finishes are available which make clothing easier and less costly to care for. Many fabrics are permanent press and soil repellent. Check garment tags for fiber content. Save tags and labels from a variety of garments. In class groups, sort through these, selecting garment labels with fibers and finishes which conserve energy. Using pictures from magazines and catalogs, give four examples of how you use fibers and fabrics in your daily life. List the care they require and how they are energy efficient or energy wasting.

CONCEPT DEVELOPMENT - List all the garments you wear in 24 hours; these would include shoes, hats, hosiery, swimsuits, etc. Under each garment list all the material used in making it and the content of the material, i.e., cotton, wool, nylon, polyester, vinyl, leather, metal, etc. With each item, identify the sources of energy used in its development. Discuss the kinds of care required for different fibers and fabrics. (dry cleaning, different washer and dryer cycles, and methods, ironing required) Which uses less energy? Which uses the most energy? Consider extra expenses like gasoline used driving to dry cleaners, etc.

APPLICATION - Have students make posters or bulletin boards using pictures and information they have compiled concerning energy used to produce and maintain different fibers and fabrics.

EVALUATION - Students make a chart comparing fibers, amount of energy required in processing and amount of energy necessary in care of different fabrics.

FOLLOW-UP/BACKGROUND INFORMATION

Filmstrip "Cotton Scores New Goals", The Sanforized Company, Educational Services, Care of Karol Media, East 36A Midland Avenue, Paramus, NJ 07652

SOURCE OF ACTIVITY

Energy Management Strategies, Public Service Company of Colorado, 1982, Energy and Man's Environment.
Developed by Viki Van Ryswyk

BACKGROUND INFORMATION

CLOTHING AND ENERGY

Energy conservation is important in all aspects of clothing and textiles...from the manufacturing of the fabric, to the selection of clothing and accessories, to the care of garments and use of laundry equipment, to personal grooming.

I. MANUFACTURING OF FABRICS - Fabrics made of natural fibers are much less energy intensive than fabrics made of man-made fibers. That is, it takes less energy to manufacture natural fabrics than man-made fabrics as many man-made fibers are made from petroleum products.

   A. Natural fibers used in making fabrics for clothing include: wool, cotton, linen, and silk.

   B. Man-Made fibers used in making fabrics for clothing include: rayon, acetate, nylon, polyester, acrylic and modacrylic.

II. SELECTION OF CLOTHING ACCESSORIES - For warmth in winter, it is important to choose clothing according to fiber content, fabric construction, garment design and fit, and color. Accessories also play a key role in keeping warm. You can be comfortable at lower thermostat settings if you dress right.

   A. What is the Fabric Content? The fiber content of clothing is important to know so you can tell whether or not it will help keep you warm. Let's look at what will and what won't do the job:

      1. Cotton, wool, linen and silk are natural fibers and will absorb perspiration and allow clothes to "breathe", making you feel warmer.

      2. Polyester, nylon, acetate, etc., are synthetic fibers and won't absorb body moisture. They can make you feel clammy.

      3. Most fabrics are blends made of 2 or more different fibers. Those made of 50% natural fibers will be more comfortable.

   B. How is the Fabric Constructed? Fabrics that provide insulation because of trapped air pockets will be warmer. Fabrics to look for are:

      1. Thick or bulky fabrics.

2. Tightly woven or knitted fabrics.

3. Fuzzy or napped fabrics or those having a pile.

4. Fabric layered with other fabrics (quilted, bonded).

C. How is the Garment Designed? Garment design and fit is another way to increase warmth through clothing. Here are some guidelines to follow:

1. Wear clothing that is close fitting but not tight. There should be "wiggle" room!

2. Increase the number of layers of clothes you wear. Layers of clothing act like insulation and trap air between the layers.

3. Wear full-length garments. Long sleeves, pants of full-length slips will keep you warmer.

4. Openings around wrists, neck, ankles and waist should be close to the body.

D. Can Color be Important? It sure can! Color can work psychologically to keep you warm as well as reflect or absorb light. Remember:

1. Wear dark, warm colors (red, yellow or brown) in winter to help you feel warmer.

2. Light, cool colors (blue, green, or violet) should be worn in warmer weather.

E. Clothing Accessories

In general, accessories should be close-fitting and add an extra layer of warmth. The following are some accessories you should consider:

1. Wear a hat! Most of your body heat escapes at your head, so cover it up!

2. A scarf or muffler around your neck will help keep cold air from entering.

3. Mittens are warmer than gloves. Your fingers help keep each other warm!

4. To keep your legs warm, wear full-length socks or panty-hose.

5. Your feet will be warmer in enclosed shoes or boots. Be sure they aren't too tight!

6. Belts will help control air movement around your waist.

F. The following figures are from the Oregon State University Extension Circular 926, May 1977.

According to figures provided by the U.S. Army Ergonomics Laboratory, and according to the John B. Pierce Foundation of New Haven, Connecticut, clothing changes can make significant differences in our comfort.

If a woman:	She can lower the thermostat setting:
Replaces a skirt with slacks	1.5°F
Replaces a sleeveless dress with a long-sleeved dress	.2°F
Replaces a dress made of an open weave with a tightly woven fabric	.5°F
Wears a full slip	1.0°F
Replaces a half slip with a full slip	.6°F
Replaces a sandal-type shoe with a heavier shoe	.2°F
Puts on a light long-sleeved sweater	1.7°F
Puts on a heavy long-sleeved sweater	3.7°F

If a man:	He can lower the thermostat setting:
Replaces light pants with heavy pants	.6°F
Replaces a summer-weight jacket with a winter-weight jacket	2.5°F
Replaces a short-sleeved shirt with a long-sleeved shirt	.8°F
Puts on a winter-weight jacket	4.5°F
Puts on an under shirt (T shirt)	.5°F
Puts on a tie	.2°F

Insulate...

Replaces ankle-length socks with knee-length socks	.6°F
Puts on a light, long-sleeved sweater	2.0°F
Puts on a heavy, long-sleeved sweater	3.7°F

III. CLOTHING CARE

We've come a long way in many respects over the years in appliance technology. But one of the greatest improvements of all time may well be the movement away from the washboard! In your efforts to conserve energy, you don't have to go back to the good old days (or not so good, as the case may be), especially where washing is concerned. The solar dryer (clothesline) is great in warm weather, but you will probably want to use the dryer on cold, winter days.

REVITALIZE AND RECYCLE

SUBJECT Home Economics
Clothing & Textiles

LEVEL 9-12

ACTIVITY IN BRIEF

Appraise a wardrobe for items that could be recycled and develop a plan for the completion of the recycled garments.

OBJECTIVE

After completion of this activity, each student will be able to; 1) State the significance of recycling clothing and conserving energy and give examples of clothing that could be recycled, 2) demonstrate techniques of recycling, and 3) construct a recycled garment or an accessory.

MATERIALS

Wardrobe inventory
garments to be recycled
sewing labs

TIME

2 - 4 class periods

LEARNING CYCLE

AWARENESS - To inspire the students, select several clothing items from yours and/or a family member's or friend's wardrobe that are not currently being worn and use these garments to discuss such areas as: 1) Where to find garments to recycle (closets, garage, or rummage sales, secondhand and thrift shops);2) Reasons for recycling; 3) How to decide whether garment or fabric can be or is worth being recycled; 4) what is involved in recycling; creativity? sewing skill? time? cost? 5) how can the article that cannot be made into a wearable garment be used?

CONCEPT DEVELOPMENT - Have students complete a wardrobe inventory to determine those items which are not currently usable but could be recycled or have the students look through their closet or other family member's closet for clothing items that they have not worn during the past year. A recycling inventory sheet may be helpful. The inventory sheet format may include: Type of garment; why garment hasn't been worn; changes that could be made. The first two columns could be filled out at home and the third column during a class session. Remind class of other sources for acquiring garments for recycling if they do not find suitable articles in their or family wardrobes.

APPLICATION - Each person could bring to class 1 or 2 items they listed on their recycling inventory or have acquired from other sources. Resource materials (such as magazines, pattern catalogs) and garments that have been recycled could be used for inspiration with the projects. Tracings of silhouettes similar to the garment to be recycled can be made from pictures in

magazines etc. To experiment with ideas students can sketch possible changes on the traced silhouettes. The creativity of individuals is often inspired by others. Groups of 3 or 4 persons working together on recycling ideas may provide a broader range of possibilities for use of each garment. Students should recycle their garments into useful garments or accessories.

EVALUATION - Each student will 1) state advantages of recycling clothes and list some possibilities; 2) evaluate recycling techniques for cost, time, suitability to body type, current styles; and 3) construct a recycled garment or accessory.

FOLLOW-UP/SUPPORT/SOURCES

"Clothing Care and Repair Unit" - $13.95 NASCO WAI641H
The Mender's Manual by Estelle Foote, M.D., Harcourt Brace Jovanovich, Inc. 1976.

"How to Sew and Save Money", Family Circle 9-20-77.

"Revitalize Your Clothes", Frank May films.

SOURCE OF ACTIVITY

Energy Management Strategies, Public Service Company of Colorado, 1982,
Energy and Man's Environment, adapted by Viki Van Ryswyk.

TAKE IT OFF or PUT IT ON!

Clothing's Role in Living With Solar Energy

SUBJECT Home Economics
Clothing, Selection and Design

LEVEL 6-12

ACTIVITY

Students will discuss and select appropriate clothing for fluctuating temperature conditions related to living with solar energy and energy conservation.

OBJECTIVE

At the end of this activity each student will be able to: 1) explain how the body produces, loses, and conserves heat, 2) describe how different kinds of clothing function to keep the body warm, cool, or dry, 3) evaluate outfits that will be appropriate for different kinds of activities under fluctuating temperature conditions, and 4) construct a poster illustrating how one outfit can be appropriate for changing temperatures.

MATERIALS

a window with a sunny exposure, several fans, extension cords, various types of clothing, thermometers (optional), poster paper and markers, catalogs and magazines showing clothing

TIME

2 class periods

LEARNING CYCLE

AWARENESS - Kathy lives in a solar home. She finds that room temperatures vary by several degrees from room to room at different times of the day, and that she is often too warm or too cold. Bill's parents have added a woodstove to their family's home. The temperatures in Bill's home also vary. Both Kathy and Bill go to a school where the temperature during the heating season may not exceed 65°F. They are warm in some classrooms and cold in others. Mary no longer drives to and from work each day because gasoline has become so expensive. Walking and taking the bus, she is outdoors in all kinds of weather. As energy becomes more expensive, people's lifestyles are changing. Solar and other alternative sources of energy are becoming more important, as is energy conservation. People will be exposed more and more to temperature fluctuations in the buildings in which they work, study, or live. More people will be walking or bussing, and will be outdoors more frequently. How can people adjust to the temperature changes they will face? One answer is to choose appropriate clothing. In this activity you will learn how to select clothing for living with energy conservation and solar energy.

CONCEPT DEVELOPMENT - For the next school day, plan to bring clothing to school so you can dress like someone who is going_____. Insert one of the following suggestions or your own idea:

swimming	skiing	mountain climbing
dancing	to bed	ice skating
bowling	horseback riding	golfing
to a party	roller skating	to a football game
sailing	camping	to play basketball
to school in January		to school in June

Make a list of clothing you will bring. Next day, dress in or bring to class the outfit you have planned.

Divide your class into two groups. One group should sit by a sunny window or heater. The other group should sit away from the window or heater, and should have a fan directed towards them.

Take a temperature reading at each group's location. By how much do the temperatures vary?

With your group, make a list of the reasons why people wear certain kinds of clothing.

After 5 or 10 minutes, switch group positions.

Discuss the ways the body maintains an even temperature. Make sure you include:
- what is happening to your body when you feel warm.
- what is happening to your body when you feel cold,
- ways you can increase body heat production,
- ways you can decrease body heat loss,
- conduction, convection, and radiation of body heat,
- evaporation of body moisture, and
- ways the body conserved body heat.

Move your chairs to form a large circle. According to clothing, sit in order from those who should be coolest to those who should be warmest.

Discuss how clothing affects the temperature of the body. Make sure you include:
- how clothing insulates,
- how clothing "air conditions",
- how clothing keeps you dry,
- kinds of clothing and fabrics which are good insulators,
- kinds of clothing and fabrics which are good "air conditioners",
- kinds of clothing and fabrics which are good at keeping you dry,
- the role of air spaces and fibers in fabric,
- what happens when fabrics retain water vapor,
- how clothing color affects body temperature,
- how fabrics and which kinds of fabrics "breathe" or "wick" moisture away, and
- the causes of hypothermia.

Starting with whichever of you feels coolest, explain why your outfit keeps you warm or cool.

Pretend that on the next school day you will be moving continually from warm locations to cold locations, both indoors and out. Study the table below on layering and then discuss how you could dress to meet these changing temperature conditions.

TABLE

Layering Clothes for Changing Temperatures

Choose the layers which are appropriate for the anticipated indoor and outdoor temperatures.

Layer 1:	long underwear (dual-layered or soft wool)
	heavy wool socks
Layer 2:	light shirt or sweater
	light skirt or pants
Layer 3:	wool shirt or sweater
	wool skirt or pants
	leather shoes or boots
Layer 4:	insulated vest
Layer 5:	wind-proof coveralls
	knitted wool gloves or mittens
	wool hat
Layer 6:	insulated hooded parka
	fur-lined boots
	insulated mittens

On the next school day, come to school dressed for these changing temperatures. Arrange a class fashion show. Model your outfit for the class, explaining the types of fabrics you chose, why you chose them, and how the clothes will help you adjust to changing temperatures. If your outfit is particularly adapted to one kind of activity, explain how it functions for that activity.

Use catalogs and magazines to select outfits that would be appropriate for each of the activities listed in Step 1, and that would also be comfortable under changing temperature conditions. Cut out one outfit you selected and use it to make a poster which illustrates its special qualities for temperature fluctuations.

APPLICATION - Make a collage of accessories that add warmth to a school outfit, or can be removed from an outfit to make the body cooler.

SUGGESTED EVALUATION - Each student will: 1) explain in writing how the body produces, loses and conserves heat and compare how different kinds of clothing function to provide comfort. 2) Make a poster evaluating outfits that are appropriate for different kinds of activities, and 3) choose accessories that add comfort and create a poster explaining the accessorie's function and use.

FOLLOW-UP/BACKGROUND INFORMATION

Questions

1. What clothing did you bring to class on the first day?
   Why did you choose this clothing?
2. How did it feel sitting next to the sunny window or heater?
   How did your clothing affect this feeling?
3. How did it feel sitting in the shade with a fan blowing on you?
   How did your clothing affect this feeling?
4. For what reasons do people dress in particular ways?
5. What kinds of clothing and fabrics are good insulators?
   Good air conditioners?
6. What is the best way to dress for changing temperatures?

Background

Much of the content of this activity involves class discussion. This will need teacher direction if it is to be successful. If appropriate, the background information, following, can be reproduced for distribution to students as a printed source of information.

There are many reasons why people wear different kinds of clothing: adornment, self-expression, group identity, and modesty are only a few. Buth clothing is also important for protection and survival, and for adapting to the indoor temperature fluctuations which are becoming more common as we turn to energy conservation and alternative forms of energy.

The human body must maintain a constant body temperature of 37°C. Heat loss from the body depends on the temperature of the body and the type of clothing worn. When body heat loss is greater than body heat production, we feel uncomfortably cold. When body heat loss is less than body heat production, we feel uncomfortably warm.

Balancing body heat loss with body heat production can be achieved in several ways. When we are cold, we can raise the body's rate of metabolism by taking in more food, especially carbohydrates, or by increasing muscular activity by such things as rubbing our hands or stamping our feet. We can also add more clothing to slow down the rate of heat loss from the body. The body itself will conserve heat by constricting blood vessels at the surface of the skin, reducing heat loss and routing the blood supply through the vital organs deep inside the body.

When we are warm, we want to increase the rate of heat loss from the body. The body normally loses heat in several ways: through conduction, in which the body makes contact with a cooler object, such as when we sit on the cold or damp ground or hold an ice cube in summer; through convection, in which heat is carried away from the body through the movement of air currents, either natural convection currents such as drafts or artificial ones such as fanning oneself; and through radiation, in which the body normally gives off heat waves in all directions. The body also increases heat loss through breathing and perspiring, processes in which heat is lost throuth the evaporation of body moisture.

CLOTHING'S ROLE IN LIVING WITH SOLAR ENERGY

Clothing can affect the rate of body heat loss. It can act as an insulator for the body by trapping additional layers of still air, or it can act as an air conditioner, allowing the body to cool intself by the evaporation of perspiration. Clothing can also act to keep the body dry, both from weather conditions and perspiration.

Clothing fabric is a mixture of fiber and air. The air, not the fiber, is the insulator. When fibers are woven or knitted into fabric, additional air spaces are created. Dressing to keep warm means wearing open weaves and knits that trap a lot of air. Fishnet, thermal knits, and kinky-napped and hairy-textured fabrics are better than smooth, tightly knit fabrics such as gabardine, which have few air spaces. Down and the new insulating fabrics also trap air. By layering clothing we create additional dead air spaces between each layer, thus increasing the insulating effect.

In dressing to keep warm, we should try to avoid sweating. Water vapor in clothing reduces the insulating properties of the fabric. Damp clothing continually adds moisture to the skin. Heat is drawn from the body to evaporate this moisture, resulting in uncontrolled heat loss.

Dressing to keep cool involves selecting clothing that permits air circulation and the evaporation of moisture. Less clothing should be worn, with more openings at neck, wrists, waist, and ankles for air circulation. Light colored clothing will reflect heat, keeping the body cooler.

For keeping cool during warm weather or for keeping dry during outdoor sports activities, it is important to wear fabrics that "breathe". These fabrics allow hot, moist air to pass through the fabric and evaporate from the outer surface. Cotton and wool are especially good fabrics for this, which synthetics are not. "Breathing" takes place through the air spaces between fibers. "Wicking" occurs when the moisture actually moves through the fiber to the surface of the fabric. New synthetic fibers, such as polypropylene, have recently been developed to wick moisture away; these fibers produce fabrics especially useful for winter sports.

Hypothermia results when there is excessing heat loss from the body. This often occurs when clothing becomes wet and weather conditions are windy and cold. Wool, which retains its insulative properties wven when wet, should always be the clothing of choice for cold, wet, windy conditions.

Dressing for varying temperature conditions means dressing in several thin layers. Each additional layer traps an additional layer of insulating air. When cold we can add layers; when warm we can peel layers. Living in houses heated with alternative forms of enery or spending a lot of time outdoors means dressing in layers. It is interesting to note that the "layered look" has recently become fashionable.

INFORMATION CARD

We find out how cold it is in the winter by looking at the thermometer. But the thermometer reading alone doesn't tell us how cold it feels. A lot of our feeling of cold comes from the wind. The faster the wind blows, the faster our bodies lose heat. As the speed of the wind increases, so does our feeling of cold. Wind chill is an estimate of how cold the wind makes us feel. For instance, when the temperature is 10° F and the wind is blowing at a speed of 15 mph, the wind child temperature is equal to -20° F. This means that with a 15 mph wind at 10° F we feel as cold as we do when the temperature is -20° F and the wind is calm.

The wind chill measurements were developed in 1963 from experiments done in Antarctica. Wind, however, is not the only factor that makes us feel cold. A thin person or someone whose clothes are wet will lose more heat and feel colder than another person. Being aware of the wind chill reading on a given day helps us know how to dress for the weather.

WIND CHILL FACTOR

WIND SPEED	COOLING POWER OF WIND EXPRESSED AS "EQUIVALENT CHILL TEMPERATURE"																				
MPH	TEMPERATURE (°F)																				
CALM	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60
	EQUIVALENT CHILL TEMPERATURE																				
5	36	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60	-70
10	30	20	15	10	0	0	-10	-15	-20	-25	-35	-40	-45	-50	-60	-65	-70	-75	-80	-90	-95
15	25	15	10	-0	-5	-10	-20	-25	-30	-40	-45	-50	-60	-65	-70	-80	-85	-90	-100	-105	-110
20	20	10	5	0	-10	-15	-25	-30	-35	-45	-50	-60	-65	-75	-80	-85	-95	-100	-110	-115	-120
25	15	10	0	-5	-15	-20	-30	-35	-45	-50	-60	-65	-75	-80	-90	-95	-105	-110	-120	-125	-135
30	10	5	0	-10	-20	-25	-30	-40	-50	-55	-65	-70	-80	-85	-95	-100	-110	-115	-125	-130	-140
35	10	5	-5	-10	-20	-30	-35	-40	-50	-60	-65	-75	-80	-90	-100	-105	-115	-120	-130	-135	-145
40	10	0	-5	-15	-20	-30	-35	-45	-55	-60	-70	-75	-85	-95	-100	-110	-115	-125	-130	-140	-150
WINDS ABOVE 40 HAVE LITTLE ADDITIONAL EFFECT.	LITTLE DANGER					INCREASING DANGER (Flesh may freeze within 1 minute)						GREAT DANGER (Flesh may freeze within 30 seconds)									
	DANGER OF FREEZING EXPOSED FLESH FOR PROPERLY CLOTHED PERSONS																				

Looking Back

In a broad sense, all clothing selections are dressing for solar energy, for without the energy received from the sun the earth's temperature would be -240°C! No matter what activity you engage in, whether inside or out, the presence or absence of the sun's warming rays modifies the surrounding air temperature. Even the cooling effect of the wind is caused by the sun.

You've learned how to dress for the varying temperature conditions caused by solar energy both indoors and out. You've found that layering your clothing can provide comfort over a large range of temperature conditions.

SOURCE OF ACTIVITY

U.S. Department of Energy, Solar Energy Education, March 1981.
Energy Management Strategies, EME, CT. 1-5, developed by Viki Van Ryswyk.

COLORFUL ENERGY!

SUBJECT Home Economics
Interior Design
Clothing Selection

LEVEL 12

ACTIVITY IN BRIEF

Keeping optimum energy efficiency in mind, students will choose and evaluate colors and textures to be used for interior decorating and clothing selection.

OBJECTIVE

Each student will be able to list which colors absorb heat fastest, explain how color and texture affect the psychological temperature of people and of rooms, and show examples of floor and wall treatments that can add some insulation to an existing structure.

MATERIALS

TIME 3 class periods

--4 cans of equal size
--4 thermometers
--measuring cup
--scissors
--tape
--pencils, paper, water
--posterboard, glue
--color wheel
--fashion pictures
--construction paper (black, white, red, and blue)
carpet, wallpaper, upholstery and paneling samples

LEARNING CYCLE

AWARENESS - Form small groups to do this activity. Tape construction paper around the four cans. Fill the cans with equal amounts of cool water. (Water must be the same temperature in each can). Put a thermometer in each can and place the cans in a sunny spot. Record the temperature every four minutes on graphs made for each can of water. Continue until the temperature is constant. If the graphs differ, how do you account for the differences? How can you apply what you have discovered? How will the paint and upholstery colors affect the comfort of a car? Can the color of your clothing help keep you warmer in the winter and cooler in the summer? Show a large color wheel to the class. Discuss warm and cool colors; include analogous and complimentary colors and their psychological impact. Show pictures of fashions and have students evaluate whether they give cool or warm impact.

CONCEPT DEVELOPMENT - Show samples of carpeting, wallpaper, upholstery fabric, paneling, etc. which have varying textures and colors. Discuss those which "feel" warm and cool. Discuss which rooms would be appropriate for the warm and cool decorations and why.

APPLICATION - Have students mount samples of carpeting, wallpaper, upholstery fabric, paneling, curtains, etc. onto poster board, as they would be if they were decorating a room. Have them describe what kind of atmosphere they are trying to create with the use of color and texture.

SUGGESTED EVALUATION - Students will 1) list colors that absorb heat; 2) analyze and write an evaluation of the psychological effect color has on people and themselves; 3) design a room plan including samples of wall coverings, carpet, upholstery, etc., including a written evaluation of color and texture choices.

FOLLOW-UP/BACKGROUND INFORMATION

Wherever we live, our way of life is affected by the climate. It affects the kinds of houses we build, the clothing we wear, what we do for recreation, what we eat, and, to some extent, what forms of transportation we use.

In this activity, we will investigate how color and textures can be factors in adapting to climate. Some colors reflect heat while others absorb it. Thus, if we wear something white in the sun we will be cooler than if we wear something black. Application of the reflecting and absorbing properties of color can be applied to such things as wall coverings, carpeting, upholstery, shingles and house paint.

Invite a color analyst to talk to the students on choosing personal colors. (This includes clothing choices as well as furniture items)

Invite a representative from a reputable carpet store to discuss the available floor coverings. Include: cost, energy savings, colors, textures, etc.

SOURCE OF ACTIVITY

Energy Management Strategies, Public Service Company of Colorado, 1982, Energy and Mans Environment

Minnesota Energy Activities, Minnesota Department of Education, Minnesota Energy Agency, Series F, Card 2, developed by Viki Van Ryswyk.

BACKGROUND INFORMATION

INTERIOR DESIGN FOR ENERGY EFFICIENCY

I. Interior Design for Energy Efficiency includes:

- General Information
- Wall Treatments
- Floor Treatments
- Furniture Arrangement, Design and Fibers
- House Design and Landscaping

A. History and General Information

Back in the good old days, when warmth in the home was a luxury, our fore-fathers were very energy aware. It was hard work to shovel coal or split wood and remove ashes. Their creative minds were constantly devising new ways to improve the heat retention of their homes. For instance, they had high-back chairs to protect the occupant from drafts. Tapestries on walls, ceilings and beds added warmth as well as decoration. Even before windows with draperies or curtains, fabrics were designed to cover cold walls and hang across open doors to retain the heat in a living area. The use of solar energy was a must. Few windows were located on the cold side of a house; if there were a number of sunny days during the winter, more windows were put on the south side of the house. Our creative and conservative fore-fathers also used proper landscape techniques for summer shading and wind breaks. Their homes were built with materials that were resistant to large temperature changes, and they had some insulating qualities.

With the advent of light switches, thermostats, and cheap, plentiful, reliable energy, concern for conservation became secondary. Convenience became the number one concern. What once were considered luxuries (such as lights and heat at the flip of a switch) later became absolute necessities. Daily showers, hair dryers, clothes dryers, televisions, etc. have become as much a part of our lifestyle today as coal, wood and kerosene were yesterday. But energy is no longer cheap or plentiful. As a nation we can ill-afford to waste any of our valuable energy resources.

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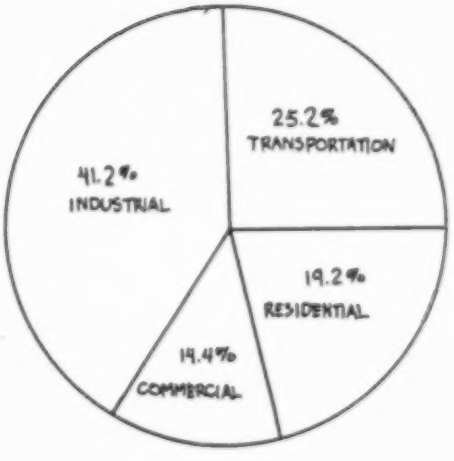
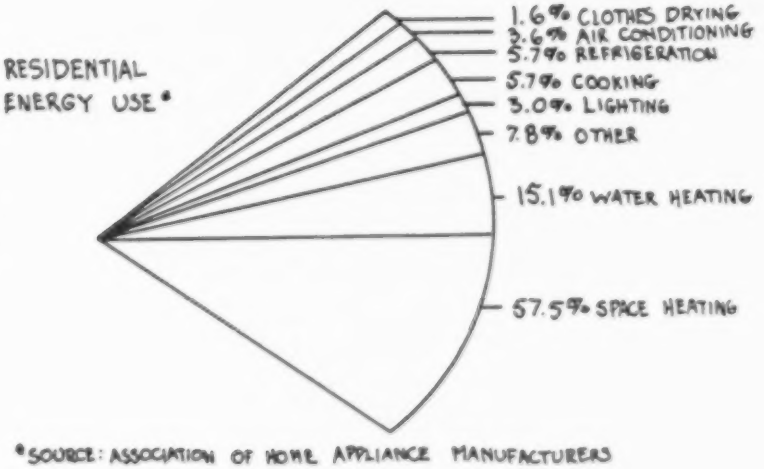




*SOURCE: ASSOCIATION OF HOME APPLIANCE MANUFACTURERS

Although the residential energy consumption accounts for only about 19% of the total nationwide consumption, every attempt to conserve energy is significant. Since most people work in a commercial or industrial sector, they can carry their conservation habits from the home to work to set an example to their co-workers.

It is very important to conserve in our homes and one of the ways to do so is to design the exterior and interior for energy efficiency.

B. Wall Treatments

To show how the surroundings in our homes affect us, mentally picture two different examples:

> Try to picture a room with orange-red textured wallpaper, perhaps a flock design, a deep-red, thick, plush carpet, a low ceiling, heavy draperies closed over the windows and soft, pillowy, upholstered furniture. Picturing this room creates warmth. It also makes the room appear smaller and more intimate.
>
> The other example is a pure white room with big glass windows, lightweight, casement, white curtains, a few blue and green accessories, a high ceiling and stark, shiny linoleum floors. The feeling one gets is cool and refreshing.

This gives an idea of some of the things discussed in this unit. It is important to be able to control psychological feelings, our environment has on our brain. We want to know how to control our environment and make it work for us to make our home more comfortable.

1. Color

A wild animal chooses his environment instinctively. Man does not. He is likely to choose his environment for psychological, economic and social reasons that may have obscured his own instincts. When man finds himself in a position of trying to satisfy those needs, he may actually cause himself unnecessary stress and unhappiness with the environment that surrounds him.

a. Physical Effects

An example of this is shown in some of the physical effects of color. In an experiment reported in the book, "How to Color Tune Your Home", it was found that students put in a single-color room had different physical and mental effects. Those students placed in a red room were found to have too much stimulation and professors actually measured an increase in blood pressure and pulse.

Placed in a blue room, the students' blood pressure and pulse declined. The students felt sluggish and their rates of activity dropped below customary levels.

In an all yellow room, there were no changes in blood pressure, but many activities were impossible because of extreme eye strain.

The all green room seemed to be the most "normal". The students complained of monotony and asked for varied color scheme, but there was no evidence of abnormal physical reaction. Thinking back to early school days, many rooms seemed to be a nondescript green.

As shown by these experiments, it's obvious that color can physically affect the body.

b. Psychological Effects

Besides the physical effects of color, the psychological effects of color are numerous. In the same experiment described above, it was found that having the room a single color was upsetting to students. Shades of color were added to these rooms and that was described as helpful; but only when complementary colors were added to the rooms did the participants seem happy.

Complimentary colors are those colors opposite each other on the color wheel. When they are placed next to each other, they produce a pleasing and stimulating effect. The reason is the after-image of one color enhancing the opposite color. The two colors seen together have a very pleasing effect.

Analogous colors, those next to each other on the color wheel, are either over-stimulating or depressing. An example would be a blue room with green accessories. That would be too monotonous and cold. An orange room with yellow accents would be a bit much.

When designing your home, keep in mind to use more than one color and colors complimentary to each other, choosing one as a main color and its compliment for accessories.

Secondly, choose the colors of a room according to its purpose and location. For rooms needing warmth, use reds and yellows. The mind associates red with fire and, therefore, makes the body feel warm. Hues with varying amounts of red are also useful. These include rusts, browns and orange-reds. Yellow also is a warm color because it is associated with sunshine.

Using these colors may just add enough warmth to inhibit turning up the thermostat and, of course, saving on the heating bill, the primary energy-user in the home.

Just the opposite of that warm and cozy room, there may be a room on the south that is unbearably hot in the summer. That room can be psychologically cooled by cool colors, blues like the ocean, green like the grass and shade trees, and purples like grape popsicles. In the winter, the chances are good there will be adequate southern light and solar heat in that room and it won't be uncomfortable even with the cool colors.

Besides adding warmth or coolness to a room, colors have a special effect. White, coral, apricot, soft pink and light green all expand space. They make a room appear larger. If coziness and seclusion are desired in a room, darker colors of browns, blacks, reds, purples, and blues are desired.

Color is also important to energy efficiency because of the amount of light that is reflected from the walls. That determines the amount of artificial lighting needed in a room. The less light we require, the less electricity used in a room. Try to avoid large masses of dark colors. Adding lighter and brighter colors will lighten a room. White reflects 80% to 90% of the light compared to a medium blue and green reflecting 20% to 30%. Ceilings should always have a matte finish and be a light color.

2. Texture

Texture, along with color and reflectancies, has an effect on the psychological impact of a room. With a textured surface, the room will feel warm, cozy, and smaller. Flocking, some plaster treatment, brick and stone will add texture to a room.

Shiny surfaces reflect light and heat and make a room feel cool. Chrome wallpaper and glass accessories are good examples of cool texture treatments.

3. Wallpaper

Wallpaper has no R-value or a negligible R-value because there is no dead air space between it and the wall. It does make sense that if your walls are very old and cracked or very new and there are no layers of paint on the drywall, wallpaper will tighten the home and reduce air infiltration. Keep in mind, most air infiltration, though, does come from points where two materials come together, for example: the floor and the wall or the wall and the ceiling. Wallpaper should be used for improving the psychological comfort of a room.

All principles previously discussed with color apply to wallpaper also.

Patterns in wallpaper need to be treated with understanding. Large patterns make a room look smaller and small patterns make a room look larger. Busy patterns also can make a room look smaller—the walls having the feeling of moving in closer.

4. Paneling, Etc.

If finishing a basement or any area where you have the opportunity to add insulation before finishing a wall, do so. On cement walls, remember the foam slab insulation is an easy one to apply. Adding drywall on top of that and then paneling makes it easy to obtain a well-insulated and attractive, comfortable wall.

C. FLOOR TREATMENTS

1. Carpeting

Another material that can be a wall or floor covering is carpeting. Carpet and padding have an R-value from 1.23 to over 2.5. Obviously, a wall partially or completely covered with carpet has an excellent psychological effect of providing a feeling of warmth in a room. It can be particularly valuable in a family or play room also, by adding a cozy and informal feeling.

Carpeting as a floor covering has many benefits. First, from an energy-saving point, a study done by Georgia Institute of Technology found carpet and pad cut heat loss through an uninsulated concrete slab 72%. Then placed over an uninsulated wood floor over a crawl space, it cut heat loss by 54%. The insulative value of carpeting is closely related to its pile depth and its density. The more dead air that is held between the fibers, the better the insulating value of the carpet.

Carpet can also save in summer by keeping warm air from entering, although the savings on air conditioning is not as great as that for heating.

Another advantage to carpeting and throw rugs is obvious. If you have ever slipped out of a warm bed on a chilly winter morning onto a cold floor, the chill can make your whole body cold. By using carpeting and throw rugs, it may actually lower your heating bill because you don't feel such a need to raise the thermostat.

The pile of a carpet will help determine the aesthetic effect in a room. An even pile provides a formal and cooler effect. A textured, uneven pile gives a warmer and more informal look.

2. Carpet Fibers

a. Wool is a good insulator. There is a blend of various wools raised for a variety of purposes such as toughness and dyeability. But, wool is very expensive. It is a good investment though for resiliency and long wear. It comes moth-proofed and in a variety of colors and patterns.

b. Nylon is the most popular carpet fiber. It is highly abrasive and crush resistant. It is easy to clean and does not stain easily.

c. Polyester is relatively new in the carpet industry. It has a soft appearance, similar to wool. Most polyesters are resistant to abrasion and crushing and easy to clean. Both nylon and polyester have a good affinity for dyes, providing the availability of brilliant colors.

d. Acrylic has the look and feel of wool. It is resilient and longlasting but harder to clean. It may not wear as well as other fibers.

e. Polypropylene and Olefin are very strong fibers. They absorb no moisture and are not very resilient and are, therefore, available only in shorter and denser carpet styles. These are best as indoor-outdoor carpet.

3. Padding or Backing

Carpet padding or backing is also very important for long wear and insulation:

1. Felted - hair or jute give firm support and long wear.

2. Sponge rubber - natural and/or synthetic rubber with a variety of thicknesses. Some are too soft for much support.

   A 60 - 80 ounce pad is need for normal traffic areas.

3. Foam Rubber - provides uniform support and long wear.

4. Urethane - another type of foam rubber which wears well and has a uniform construction.

4. Other Floor Treatments

Other floor treatments, including linoleum, are obviously cold floor treatments. Linoleum has its purpose for cleanability and durability. Use floor rugs on it in the winter to create a warmer appearance.

5. Wood flooring gives a feeling of warmth, but it is cool to the touch, and its insulative value is very slight. Wood floors are very beautiful, and if you want to maintain that look, keep them warm by insulating underneath and using room rugs.

6. Summary

Carpeting can add insulative value as well as psychological warmth to a room. Try to use a dense and deep pile if your are using it for insulation next to a cold surface. Use throw rugs on those cold surfaces where you will be standing if carpeting is not practical.

FASHION OR FAD?

SUBJECT Home Economics
Clothing, Textiles

LEVEL 9-12

ACTIVITY IN BRIEF

To be able to determine energy efficient wardrobe options and plan wise clothing selections in a wardrobe planning unit.

OBJECTIVE

After completion of this activity, each student will be able to; 1) distinguish between classic fashions and fads, and 2) design a wardrobe plan which reflects energy management concepts.

MATERIALS

Magazines, catalogs, pattern books
Clothing selection text
Scissors, glue, markers

TIME

2 class periods

LEARNING CYCLE

AWARENESS - Using pictures from magazines, catalogs, and pattern books, make a collage of garments and accessories that are classics and fads. Find five examples of classic styles and five examples of faddish styles and label each picture used.

CONCEPT DEVELOPMENT - Discuss differences in classic fashions and fads. Emphasize selection of garments that are multi-purpose and practical. Show film on fashion development through history. Discuss how to evaluate your wardrobe to build classic combinations.

APPLICATION - Students should analyze their wardrobes and inventory the items they consider to be "classic" and "fad". Determine what classic items could be added to extend wardrobe either for school, work or leisure time activities.

SUGGESTED EVALUATION - Each student will 1) distinguish between fashion and fad by labeling pictures mounted side by side, and listing distinguishing criteria, and 2) make a wardrobe plan from their present closet and predicted future needs.

FOLLOW-UP/BACKGROUND INFORMATION

Energy conscious consumers recognize the importance of choosing classic fashions instead of fads. Classic fashions are considered energy conserving because the garments remain in style and can be worn for a long period of time. Fads are energy wasting because generally the garment is seasonal and when the garment is discarded the fabric may not be recycled. Additional energy is used in making man-made fabrics and sewing or buying a new garment.

Film: "Fashion - A History"

Use Home Economics text for background.

SOURCE OF ACTIVITY

Energy Management Strategies, Public Service Company of Colorado, Energy and Man's Environment, 1982, adapted by Viki Van Ryswyk.

LAUNDRY SAVERS

SUBJECT Home Economics
Clothing Selection
Textiles

LEVEL 9-12

ACTIVITY

Students will use experiments to compare: different brands of soaps and detergents, different temperatures of water, and hard and soft water, on their cleaning ability and energy use.

OBJECTIVE

Each student will be able to analyze energy conservation in laundry techniques comparing different brands of soaps and detergents, different water temperatures, and hard or soft water.

MATERIALS

laundry soap, laundry detergent, measuring cup, two 1 gallon jugs with caps, scissors, dirty rags.

TIME

1 class period

LEARNING CYCLES

AWARENESS - Give each student an index card to write answers on. Ask each student to write all the energy expenditure required to clean all the garments they are currently wearing (including jackets, socks, shoes, etc.). Remind them to think about washer temperatures, the number of loads required, the length of time for each load, the kind of soal or detergetn and how it was produced, the drying methods, ironing, etc.

CONCEPT DEVELOPMENT - Present information on laundry techniques and tips. May show films or filmstrips here. Brainstorm all the brands of soaps and detergents you can think of. List all the claims each brand advertises and discuss what may influence your choices.

APPLICATION - Perform experiments comparing: different brands of soaps and detergents, different water temperatures, different water (hard or soft). Make value judgements using good-bad, better-worse, high energy use-low energy use.

SUGGESTED EVALUATION - Students will determine what brands of soaps and detergents, water temperature and qulity of water (hard, soft) will contribute best to energy conservation in laundry techniques.

FOLLOW-UP/BACKGROUND INFORMATION

Learning About Laundering, Teaching kit from Procter and Gamble Educational Services.

SOURCE

Superific Science, Book XI, Learning About Energy
Energy Management Strategits, Public Service Company of Colorado, 1982.
Energy and Man's Environment.

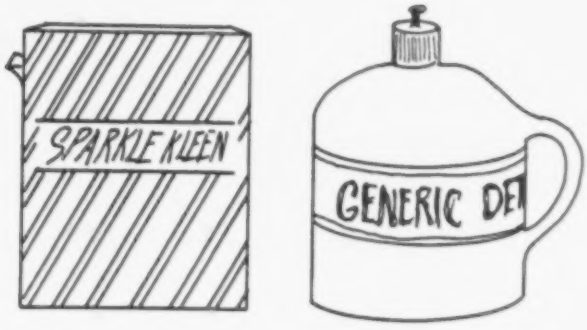
ACTIVITY

There are many different brands of laundry soaps and detergents available today. What do their advertisements claim? Which ones work the best? Which is most energy efficient?

Experiments: Fill the gallon jars three-fourths full of warm water. Add 1/4 cup of detergent to one jar and 1/4 cup of laundry soap to the other. Cut the dirty rag into two equal parts and put one piece of the rag in each jar. Cap the jars and shake. Allow to soak a few minutes. Remove the rags and rinse well in warm water. Twist out excess water and compare. Recor your results.

Variations:
1. compare different brands of detergents or different brands of soap to each other.
2. compare the same detergent in different temperatures of water.
3. epsom salts make water hard. Rainwater or distilled water is soft. Make a comparison of the same detergent or soap in hard and soft water.

Detergent suspends dirt particles enabling them to rinse free of fabric easily. Rinsing with clear water is not as necessary as with soaps. Therefoire it saves energy; less rinse time, cold water rinse. Also, less energy use of equipment. Soap requires a higher temperature water to be most effective, therefore using more energy.



There are many ways to make your present washer and dryer more energy efficient, and still keep the conveniences they offer. Here's a laundry basket full of conservation ideas.

A. Energy Conservation Tips

For Your Washer...

1. Very little energy is used to operate the washing machine motor, infact, about 90% of the energy goes twoard heating the water. So, most important way to save energy - and money - is to use less hot water.
2. Use a cold water rinse.
3. Use hot water only for heavily soiled loads and for sanitation purposes (i.e. baby diapers, bedding from people who have been ill, etc.). You can use warm water for lightly soiled clothes.
4. Wash full loads or make use of the water level setting for smaller loads so you don't waste hot water.
5. Don't over wash your clothes. Use short cycles for delicate clothes.
6. Keep the lint filter clean to make your washer run more efficiently.

B. For Your Dryer...

1. The most important way to save energy is to shorten the drying time whenever possible. In order to do this, you have to know what a proper dryer load is. Don't mix heavy and light articles or synthetics and permanent press with cottons in the same load. If you do, your dryer will run longer - and waste energy.
2. Don't overdry your clothes. Most fabrics ahve some natural moisture and should not be "bone dry." Try to reduce your regular drying time by about five minutes or more
3. Operate your dryer with a full load, but don't overload as clothes need tumbling room.
4. Keep the lint filter clean. Clean it after each load and check it before each load.

Title: Laundry Savers (cont'd)

B. Cont'd.

5. Vent your dryer to the outside of the house. Code specifies you must vent outside if you have a gas dryer - for safety reasons. Use the straightest, shortest duct for venting. Check the venting on the inside often to make sure it is free of lint.

   Whenever you dry a load of clothes, approximately 20,000 BTU's of heat are funneled through the vent and go outside as wasted energy. Therefore, you may decide to vent your electric dryer into the room. But, be sure that you have some method of catching the lint. Also, you shouldn't vent the dryer inside if it is near the furnace as there are products in the dryer exhaust that can harm your furnace. Also, if you vent to the inside, don't dry more than two loads consecutively as the added moisture in the room can cut down on the efficiency of your dryer and cause condensation problems.

6. If possible, dry loads one right after another.
   In doing so you can use the heat left over by the previous load.
7. Use a clothesline whenever possible.

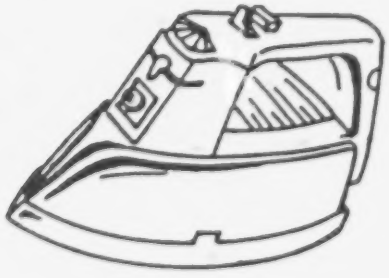
C. Buying a New Washer and/or Dryer?

Look for these features when buying a washer...

1. Controls to select various water levels and water temperatures.
2. Suds saver feature (you can re-use wash water for additional loads).
3. Compare models for water usage.
4. Look at energy labels and compare operating costs.

And these features and points when buying a dryer...

1. Thermostat or moisture sensor with a buzzer to indicate the end of the cycle to save on ironing time.



2. An "easy to reach" lint filter.
3. pilotless ignition on gas dryers.
4. Variety of settings for different types and weights of fabric.
5. Consider a gas dryeer as it will cost less to operate.

Title: Laundry Savers (cont'd)

D. Ironing: Are you a "one-time presser"? Do you press only what you'll be wearing and nothing else? Plan your ironing using these helpful hints:

1. Press your garments one after another to cut down on reheating your iron.
2. Begin ironing garments that need a lower setting and build up to a higher wetting. Then lower the setting and finish with garments that need a lower setting and build up to a higher setting. Then lower the setting and finish with garments that need a low temperature.
3. Turn your iron off a few minutes before you are finished.
4. Use steam whenever you can.

How Soaps and Detergents Work.

Laundry soaps and detergents are both cleansing agents designed primarily to remove soil from fabrics. While they differ appreciably in their chemical make up, the main difference between soaps and detergents that is of importance to consumers is the way they work in hard water. As discussed in the previous section, soaps give very satisfactory performance in soft water, but in hard water they combine with the hardness minerals to form "lime soap" or soap curd. When picked up by the fabrics, lime soap appears as a visible white deposit. Because lime soap carries soil with it, it can make white fabrics look dingy and colors look dull. Detergents do not form this curd or film in hard water.

Despite their differences, soaps and detergents accomplish their cleaning task in much the same way. Both of them do the following things:

- o They increase the wetting ability of water by reducing its surface tension. This makes the water penetrate the soiled fabric more easily.
- o They loosen dirt and soils from the fabrics.
- o They suspend the removed soil in the wash water.

Some products perform one or more of these functions more efficiently than others.

Soaps and detergents used for laundering have two main classifications:

- o Heavy duty products: designed primarily for the regular family wash, but suitable for use on all washable fabrics. Some of these products are all-purpose detergents.
- o Light duty products: Suitable for lightly soiled fabrics.

Heavy Duty Detergents

The majority of all washing products fall into this category. These products are suitable for the whole wash, ranging from heavily soiled work clothes to diapers to lightly soiled, delicate lingerie.

Most of these detergents are granular in form. However, there are a few in liquid form.

Laundry Savers (cont'd)

Detergents must be further classified by their sudsing characteristics because this influences how they will be used.

HIGH SUDSING DETERGENTS (examples: Tide, Cheer, Oxydol, Dreft, Duz)

- Truly all-purpose products, used primarily for laundering but are also used for hand dishwashing and hoime care.
- Most popular type of detergent.
- Can be used in all top-loading washers (automatic or wringer).
- Provide lasting suds on the surface of the water if a sufficient amount of detergent is used.

INTERMEDIATE SUDSING DETERGENTS (examples: Bold, Gain granular; Era, liquid)

- Provide a lower level of suds.
- Can be used in all top-loading automatic or wringer washer. Are especially well suited to those washers that are suds sensitive.

LOW SUDSING DETERGENTS (Example: Dash, granular).

- Are especially recommended for front-loading, tumbler-type automatic washers or washer dryer combinations because of their low suds level.
- Can also be used in all top-loading automatics or wringer washers.

The intermediate and low sudsing detergents are laundry detergents. They are not designed for other cleaning tasks.

Most of these detergents will work satisfactorily in all water temperatures, provided they are used in the correct amounts. All detergents, even those designed for cold water washing, will give better cleaning results in hot water than in cold water.

LAUNDRY ISSUES

<u>The Use of Energy in Home Laundry</u>

Let's take a look at energy usage as it applies to home laundering.

Nationally, 80% of all the energy consumed is used outside the home to support industrial, transportation, communications and other major systems. The remaining 20% is used by households for home heating and other necessary functions.

Of the energy consumed inside homes (20% of total national energy consumption) the various laundering functions use the following approximate percentages:

Functions	% of Total Household Energy	% of Total National Energy
Heating water for washing	3.0%	0.6%
Running washer	0.5%	0.1%
Running automatic dryer	2.5%	0.5%
Total	6.0%	1.2%

From these figures it can be seen that less than 1% of total national energy consumption is used to heat water for home laundering and that just over 1% is used for the total job of washing and drying.

Even thought the percentage of energy used is small, every effort should be made to conserve it where possible. In some cases this may mean that a consumer would select warm rather than hot water for washing clothes. In fact, many garment cre labels recommend warm water to maintain the quality and appearance of an item. In addition, rinsing in cold water can save up to 1/3 of the energy used for heating water for laundering and will provide very satisfactory results.

However, some items such as heavily soiled clothes need a hot water wash to get them clean. Considering the relatively small amount of energy used in laundering, it would seem advisable to continue to allow consumers the freedom of choice to use a hot water wash when necessary. Consumers are presently exercising judgment in that choice.

Recent surveys show a change in consumer laundering habits in response to the new care requirements of certain washable items, the rising cost of energy and the national effort toward energy conservation.

Water Temperature All Laundry Loads	1970-71	1976-77	Change
Warm	35%	50%	+15
Hot	50%	35%	-15
Cold	15%	15%	0

Worksheet #1

WHAT DO YOU KNOW ABOUT DETERGENTS?

Read the statements below. Do you think they are True or False? Explain your answer in the column at the right.

Detergent Statements	True/False	Explanation
1. There is not much difference between soaps and detergents.	FALSE	There are important differences in the way soaps and detergents are made and in the way they work, especially in hard water.
2. All detergents work equally well in all types of washers.	FALSE	Light duty liquid detergents would suds too much in an automatic washer. Low sudsing detergents are especially recommended for front-loading tumble-type automatic washers or washer/dryer combinations.
3. High sudsing detergents are more powerful than controlled sudsing ones.	FALSE	Both are designed to clean the whole wash effectively.
4. Most detergents clean better than soap in hard water.	TRUE	Detergents perform more efficiently than soap in hard water.
5. Clothes can become dingy if too little detergent is used.	TRUE	Underuse of detergent is the most common cause of unsuccessful laundering.
6. You need to use more detergent in soft water than in hard water.	FALSE	In soft water <u>less</u> detergent may be needed. In hard water more detergent is needed to tie up the excess minerals.
7. To remove greasy/oily spots it is helpful to rub in a bit of liquid laundering detergent before washing.	TRUE	Most of the liquid detergents do a good job of getting out oily soil, especially when they are applied undiluted in pre-treating.

8. Most detergents work well in cool, warm, or hot water.	TRUE	Most detergents work well in all water temperatures; however, all detergents clean best in hot water because cold water makes the cleaning job more difficult.
9. Liquid and granular laundering detergents both work well.	TRUE	Both are heavy duty products designed to clean the whole wash effectively.
10. Liquid detergents are all the same.	FALSE	Light duty liquids are designed for washing dishes but can be used for the handwashing of slightly soiled items. Heavy duty liquids are designed for the care of all fabrics and are the only liquid detergents which should be used in a washing machine.

LIVING WITH ALTERNATIVE ENERGY

SUBJECT Home Economics
Housing & Family Life

LEVEL 9-12

ACTIVITY IN BRIEF

Students will identify different energy lifestyles by discussing 3 case studies, as a small group, then identify ways in which energy resources can be saved, in a large group.

OBJECTIVE

Each student will be able to: 1) identify the kinds of energy used to heat homes, 2) state whether each kind of energy is a renewable or nonrenewable resource, 3) analyze the changes in lifestyle that each change in energy use would require, and 4) state the commitment needed to live in a house heated with an alternative source of energy.

MATERIALS

a notepad and pencil for recording

TIME

2 class periods

LEARNING CYCLE

AWARENESS - Have you ever thought about what it would be like to live in a house that was heated or cooled by solar energy? How would your life be different if your family decided to heat your home primarily with wood? Using alternative sources of energy in your home would cause some changes in the way your family lives. These changes are often called changes in lifestyle. In this activity you will read about families which have different energy-consuming lifestyles. As you read each case study, think about the type of energy the family is using. Is it a renewable or nonrenewable energy resource? How has it changed the family's lifestyle? Perhaps you can imagine what it would be like for your family to live in each of the houses described in the case studies.

CONCEPT DEVELOPMENT - Discuss the background information, introducing students to the idea that lifestyle changes do occur as a result of increasing energy costs and shortages of supply. Adaptations by families can be very creative, with each person in the family sharing some responsibility for a conservation behavior. Divide into small groups, appointing one person as recorder. Read and discuss each case study. Answer the questions in the question section.

APPLICATION - At the conclusion of the group discussions, the class will reassemble and discuss the case studies. The teacher should stress the importance of conservation behaviors as a means of saving energy and the responsibility each student has in achieving an energy-conserving lifestyle. Have students write an essay on living in a home that uses an alternative form of energy. What would it be like? How would they adjust? Would they like it?

SUGGESTED EVALUATION - Students will 1) list energy used to heat homes; 2) identify each as renewable or nonrenewable; 3) predict changes in lifestyle that different energy uses would require; 4) propose and justify commitments they personally would need to live in a house heated with an alternative source of energy.

FOLLOW-UP/BACKGROUND INFORMATION

You have had the opportunity to look at three different methods of heating a home. Each method consumed different amounts and kinds of energy. Each method also required a different family lifestyle and varying degrees of commitment by family members in order to save energy. Family members sometimes had to substitute human energy and time to conserve nonrenewable energy resources. They learned the role cooperation between family members plays in reaching family goals. Perhaps you can think of ways your family can work together to conserve nonrenewable energy resources.

How could each case study situation be used to improve the relationships between family members?

How could families lower their energy consumption?

Human energy may have to be substituted for nonhuman energy in order to save valuable resources. What effect could this have on the amount of time family members spend doing household tasks? How will it affect the homemaker's time?

What do you think it would be like to live in a solar home? A home heated with wood?

With leadership from the teacher, students should understand that the lifestyles of families/people will change when they use alternative forms of energy.

Have students write their own case studies for discussion.

Invite a person who lives in a solar home or uses a wood-burning stove to discuss changes in lifestyle with the class.

As the reality of the scarcity and escalating cost of nonrenewable resources becomes more apparent, more families will look to alternative forms of energy to heat and cool their homes. To a certain extent this means that their lifestyles will change. To conserve energy certain tasks what were formerly unnecessary will become the responsibility of family members. Thus, it appears there will be a substitution of human energy (which is renewable) for nonhuman energy. Some families may not want to exert human energy to conserve energy resources and may even be willing to pay the ever-increasing price for convenience. This is a decision each family will have to make.

Families considering ways to conserve energy will have to recognize that some changes in the way they live may be necessary. There are many examples of this. Families that live in poorly insulated houses may find that it is economical to shut off certain portions of their homes and confine their activities to other portions. Turning off lights, turning down the heat, shutting the water off while shaving, fixing and caulking storm windows, weatherstripping, driving less, preparing oven meals, washing laundry in cold water, and eating fewer processed foods are examples of some changes in lifestyle.

Other changes may have more impact on the ways in which families function. Using a wood-burning stove may mean extra time will have to be spent cutting, splitting, stacking, and preparing wood. The fire will have to be loaded periodically throughout the day. Soot may require extra cleaning by family members. At times the house may seem too warm or too cold. These are all examples of changes in lifestyle. Some families have not considered these changes before making the decision to purchase a wood-burning stove. For others, purchasing a stove is a way to become more self-sufficient. These families are satisfied knowing that they are not dependent on oil, natural gas, and electric companies for energy. They enjoy the exercise of preparing wood for burning. They feel content sitting together around a warm stove on a cold winter's night.

For those who live in a passive or active solar home, there are also changes in lifestyle. Opening and closing draperies or shutters to allow the sun in or to block the sun out is a very important job. The schedule for activities such as showering, bathing, and washing clothes or dishes may not always be convenient. Planning for periods when the sun does not shine can change the way a family lives. Despite these changes, many families have found living in a solar home an exhilarating experience. They fell free from dependence on outside sources of energy. They feel they have more control over their own activities. They are satisfied in knowing that they are conserving the world's finite resources while saving money too.

SOURCE OF ACTIVITY

Adapted From New York State Solar Curriculum,
U.S. Department of Energy, Solar Energy Education
March, 1981; adapted by Viki Van Ryswyk, 1986

Case Study 1

The Warners moved from a large mid-western city to a small town in the country. Mr. Warner was transferred by his company to manage a factory located in the town. Mrs. Warner had worked as a technician in a medical office, but did not plan to begin work in the new location for several months, until the family was well settled. The Warners have three children of elementary school age.

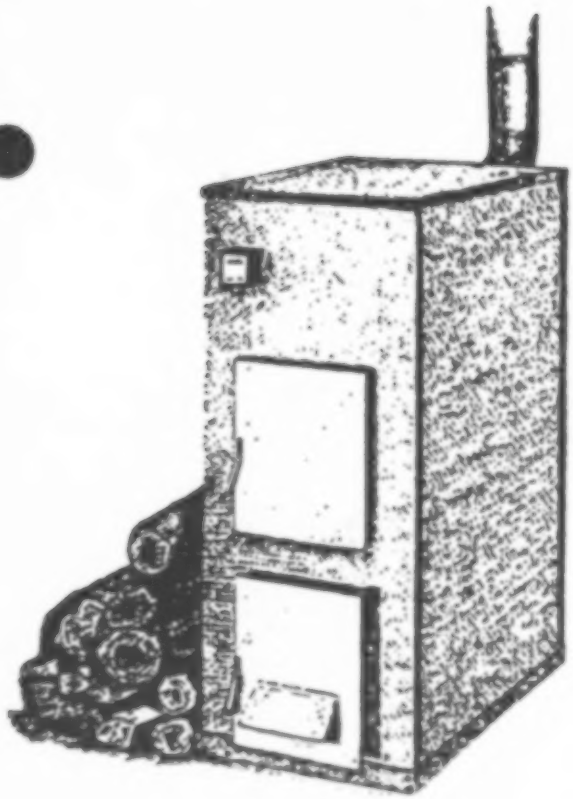
The family found an older single-family dwelling in their new town. It was close to the school the children were attending and within walking distance of most community services.

The home the Warners moved into was built in the late 1930's. It was a two-story home with a living room, dining room, kitchen, three bedrooms, and one and one half baths. One bedroom was on the first floor. The house was insulated with 3 inches of cellulose insulation in the ceiling and almost none in the side walls. All the windows and doors had wooden storm windows which were in need of caulking.

The elderly couple from whom the Warners bought the house indicated that the heating and hot water bills were not unreasonable for a house of that size. The heating system utilized a gas-fired furnace which had been converted from coal some years earlier. Water was also heated with natural gas.

The Warner family moved into the house at the end of the summer and adjusted well to their new home and community. As the weather became colder, the family noticed that the monthly heating bills were quite high. Mrs. Warner was home all day and consequently did most of the housework then. The children were in and out of the house frequently. The Warners' monthly bills were higher than they had expected and exceeded the amount they had originally budgeted for heating costs. The Warners had not realized that during the cold winter months the elderly couple had closed off the upstairs and conducted most of their daily activities on the first floor.

The Warners determined that the house needed more insulation, but this could not be installed until Mrs. Warner went to work and enough money for it could be saved. In the meantime, the family realized that its lifestyle would have to be adjusted.



Case Study 2

The Burns family lives five miles outside of a small northern city. Ten years ago they built a ranch home for their family of six on five acres of heavily wooded land. They have four sons: Robert, age 18; Kenneth, age 16; George, age 12; and Jonathan, age 9. Their home has been the source of much enjoyment for them. Both Mr. and Mrs. Burns work in the city. Mr. Burns works as a building inspector and Mrs. Burns works as a manager in a local department store.

For several winters the Burns had been keeping track of their energy costs. They had noticed a 68% increase in the price of fuel oil in four years. Fuel oil was used to heat their home as well as to heat hot water for the family all year long, and with four children the need for hot water was great! With their eldest son Robert contemplating college, Mr. and Mrs. Burns were concerned about the additional financial responsibility they would soon incur.

The family decided that one way in which they could save money and energy would be to install a wood furnace in the basement. The wood furnace could be hooked to their oil-fired furnace as an auxiliary source of heat for the house. Hot water for domestic use could also be heated by the wood furnace. The family realized that they had a source of wood right in their own backyard. Since Mr. Burns had indicated a desire to start a garden, the family cut the trees down in that section of the yard which was to be used for gardening.

The wood furnace was installed and the family worked together chopping and stacking wood. During the fall and winter, when heat was required, the family used the new wood furnace. It was necessary to feed the wood furnace three times per day: in the morning, after school, and in the evening before bed. After a period of adjustment, the Burns found their wood-heated home very comfortable and were content with their attempt to save money and conserve on the world's limited resources.

Case Study 3

The Rogers family, which consists of father, mother, and two children (Marci, age 13, and Melanie, age 9), realized that they had outgrown their small bungalow in a southwestern city. They looked at several larger homes for sale in their city, but decided that none of the homes they saw met their expectations. Because energy costs were rapidly increasing in their part of the country, they sought a home that was built with energy conservation in mind. The Rogers wanted a home which would be inexpensive both to heat in the winter and to cool in the summer.

After much thought, the Rogers decided that perhaps the only way they would get their energy-efficient home would be to build one. They looked at many house plans and finally decided to build a passive solar home. After consulting both an architect and an engineer about the plan, they found a general contractor who built the home for them.

The home was planned with floor-to-ceiling windows on the south side of the house and very few windows on the north side. The windows had shades which could be raised or lowered in order to control the entry of the sun's rays into the house. The interior of the home was open and had spaces which could be adapted to the activities of the family. This was in marked contrast to their former home, in which each individual room had a separate purpose.

While the home was being built, the Rogers planned the interior decoration and the landscaping. They considered such factors as the type of trees and shrubs which should be planted around the house and the type of furnishings which would absorb or reflect the sun's rays.

The Rogers excitedly moved into their energy-efficient passive solar home. After several months the family members sat down one evening to discuss life in their new home. They realized that their heating costs were quite low and that the house was exceptionally comfortable. One reason for this was that they had learned to manage the house efficiently. In discussing their current home maintenance activities, they commented on the ways in which their lifestyle had changed.

Questions

Case Study 1

1. In what ways could this family adjust its lifestyle to save energy?

2. What kind of energy is used to heat this house? Is this energy renewable or nonrenewable?

3. Considering the family's financial situation, what small structural changes, which would not be too costly, could be made to this home to make it more energy efficient?

4. What large structural changes would you suggest?

5. How will this family's energy needs change as the children get older?

6. In the future, what energy factors should this family consider when making a housing purchase?

Case Study 2

1. What changes in family lifestyle would occur as a result of heating a house with wood?

2. What heating costs did this family have after the wood furnace was installed?

3. What changes in responsibilities occurred when this family switched to wood heating?

4. What will happen when the family runs out of wood on its property?

5. Who will take care of the stove and wood-cutting process when all of the boys have moved away from home?

6. What changes could the Burns make to the structure of their home to make it more energy efficient?

7. What kind of energy had the family been using before switching to wood?

8. What would happen if most families started using wood for home heating?

Case Study 3

1. What kinds of activities did the Rogers have to perform to manage their house efficiently?

2. What changes in lifestyle would be necessary as a result of living in a passive solar home?

3. What might have happened to the family's heating costs if the house hadn't been managed properly?

4. What energy resources did the Rogers save by living in a passive solar home?

5. What other resources did the Rogers use in order to conserve energy?

ELECTRICITY FOR FUN, CONVENIENCE, WORK

SUBJECT Home Economics
Housing

LEVEL 9 - 12

ACTIVITY IN BRIEF

The students will rate their dependence on electricity by problem solving activities without using electricity and determining their electrical dependency rating.

OBJECTIVE

Each student will be able to: 1) solve problems related to energy use; 2) define values as related to energy use of electrical appliances. Each will be able to predict ways in which to cut down on electrical use throughout their lives.

MATERIALS

electrical use survey
problem-solving activity cards
box of items found around the house
sandy piece of carpet
stained clothes
ice cream
ice cubes
plastic bag
slice of bread

TIME

One class period

LEARNING CYCLES

AWARENESS - Various problems will be posed for the students to solve without the use of electricity. They may work in small groups with the use of household items supplied by teacher, and will have a set time limit.

CONCEPT DEVELOPMENT - As a large group, discuss the success/failure/difficulty of the problem solving. Given a list of household electrical items, students check the column which best describes their attitude toward doing without the item. Students rate themselves by counting up the number of items they could live without.

APPLICATION - Determine what household jobs could be done adequately without electricity. List conditions you could control to help cut down on electrical use.

SUGGESTED EVALUATION - Students will 1) write their values concerning energy use, and 2) propose and justify reasons for some ways in which they could conserve electricity.

ACTIVITY

Divide students into groups of 3 or 4, with the exception of one group of two. Present them with problem-solving cards and a time limit of 15 minutes to solve the problem without the use of electricity. (Make sure to keep the lights off!!) Possible examples: to include on cards:

1. You have no electricity and your hair is a mess! You must have your hair curled and dry within 15 minutes otherwise you will be late for.....

2. You have 15 minutes to get all the sand and mud off this piece of carpet (no electricity) [Need to supply a dirty piece of carpet here]

3. You have 15 minutes to remove the stain from this garment, wash and dry this garment so there are no wrinkles. (NOTE: Do not use hot water if heated by electricity)

4. Given a bowl with ice cream, and a bowl of ice cubes, do not let the ice cream melt for 15 minutes.

5. Given a piece of white bread, have the bread completely toasted in 15 minutes.

6. With all the time pieces removed from the room, keep accurate time for the 15 minute problem solving activities to within 30 seconds. [This is for the group of two.]

At the front of the room have a large box of household items which can be used by the first group requesting the items. Include cardboard, styrofoam, newspaper, wood, plastics, cotton balls, paper clips, feathers, spoon, fork, rubber spatula, hair spray, pencils, erasers, baking soda, vinegar, plastic bag, magnifying glass and matches.

Discussion will follow concerning problems and successes, even failures. Discuss our dependability on electricity. Fill in chart on electrical attitude rating. May also want to discuss and complete #2,3,4.

Instead of charting results on board, have the students line up in the room by their ranking of the willingness to give up the items.

FOLLOW-UP/BACKGROUND INFORMATION

A follow-up activity may be for students to spend 24 hours without using an electrical appliances. (have documented by parents) May have students write a short story of what life would be like without the use of electricity. Students may read books or articles of pioneer times and life without electricity. (Laura Ingalls Wilder "Little House" series)

SOURCE OF ACTIVITY

Taken from Iowa Developed Energy Activity Samplers (IDEAS), Home Economics, by Viki Van Ryswyk.

ELECTRICITY FOR FUN, CONVENIENCE, WORK

Please answer the following survey as honestly as you can. There are no right or wrong answers.

1. Check the column which best describes your attitude toward doing without the following electrical items. Even though some of these items may also be powered by natural gas or gasoline, assume an ALL ELECTRIC environment.

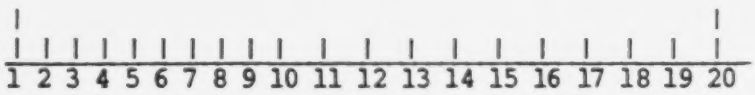
Item	Easily	With Some Difficulty	With Great Difficulty	Would not Give This up
radio				
stereo				
television				
air conditioning				
dishwasher				
clothes washer				
iron				
microwave oven				
stove				
refrigerator				
freezer				
lights				
electric mixer				
electric razor				
space heater				
toaster				
elevators				
hair dryer				
dehumidifier				
fans				
vacuum cleaner				
electric games				
blender				
electric blanket				
typewriter				
calculator				
dentist's drill				
telephone				
clothes dryer				
hot water heater				
garbage disposal				
power tools				
electric golf cart				

2. Just for fun, rate yourself by counting up the number of checks in the last three columns____(all but "easily").

   If there are ten checks or less, you could tolerate a rather low dependence of most electrical appliances. If you count 15 checks or less in the last three columns, your use of modern appliances is moderate. If you have 16 or more checks in those areas, you are quite dependent on electricity for your lifestyle. On the number line below, plot your dependency on electricity.

   What is your electricity dependency rating?

≤ 10 checks	11-15 checks	≥ 16 checks
Low	Moderate	Dependent



3. Which of the following jobs could you do adequately in your house without electricity? (Circle them)

   a. cooking
   b. washing clothes
   c. drying clothes
   d. washing dishes
   e. drying hair
   f. storing food in summer
   g. storing food in winter
   h. lighting
   i. keeping warm in winter
   j. keeping cool in summer

4. In order to guarantee the continuation of those services which you find difficult or impossible to do without (see 1), it may be necessary for you to accept some of the following conditions. On a scale from one to seven, let #1 represent the most tolerable living condition and let #7 represent the least acceptable one. In which order would you accept:

   _____having no more than two children
   _____living within ten miles of a nuclear power plant
   _____possibility of food contamination
   _____occasional interruption of power
   _____increased cost of electricity
   _____severe air pollution
   _____shorter life span

THE BAKER'S DOZEN

SUBJECT Home Economics
General

LEVEL 6 - 8

ACTIVITY IN BRIEF

Students will determine essential services and devices which require electricity that people are dependent upon.

OBJECTIVE

Each student will be able to 1) state the degree of dependency upon electricity displayed by his/her family and by the community; 2) state electrical preferences; and 3) state their opinion/analysis by writing a paragraph of future energy sources.

MATERIALS

notebook, energy/appliance reference books

TIME

1 hour

LEARNING CYCLE

AWARENESS - Given a quiet atmosphere, the instructor leads the students into imagining how they would prepare for school without the use of electricity. The teacher may incorporate imagery as much as feels comfortable leading up to these basic questions: How would you dry your hair without your hair dryer? How would you curl your hair without the electricity to run the curling iron? How would you put on make up without lights to see?

CONCEPT DEVELOPMENT - Have students list all electrical devices in their house. Total the list. Check around the class to see who has the longest list. Read it aloud so others have a chance to add any appliances they may have forgotten. Check the 13 electrical devices that are most important to you. Draw a line through the four you can most easily do without. Draw a circle around the four you could <u>least</u> easily do without

APPLICATION - Generate a list of essential services which require electricity that you and your community are dependent upon. Explain how power companies contribute to air and thermal pollution. Describe how your favorite electrical device may be powered in the year 2010.

SUGGESTED EVALUATION - Students will 1) state the community electrical dependency by combining results from all surveys and making a generalization; 2) identify their electrical dependency by completing the survey, and 3) respond in writing to the questions in "Follow-Up" using problem solving skills and hypothesizing and prediction.

FOLLOW-UP/BACKGROUND INFORMATION

May wish to include "Electric Dollars and Sense", a speaker presentation from Iowa Power and Light Company.

Film available through Iowa Power and Light Company, "Saving Energy at Home: Ramsgate Films.

Follow-up reading may be: Laura Ingalls Wilder's "Little House on the Prairie" series.

May have students write reports on "Life Before Electricity" or "Life in 2020", as related to electrical devices and use.

Factual discussion and value clarification will result with the use of the following questions (some of which may be written assignments or projects):

Limit yourself to a one or two paragraph answer for the following questions.

1. What causes black outs and brown outs?
2. Who actually controls a public power company?
3. What are the particular advantages of electricity?
4. What do you do to conserve electric power?
5. Generate a list of essential services which require electricity that you and your community are dependent upon.
6. Explain how power companies contribute to air and thermal pollution.
7. Describe how your favorite electrical device may be powered in the year 2010.

SOURCE OF ACTIVITY

Taken from I.D.E.A.S. p.277, 1979, by Viki Van Ryswyk.

ACTIVITY

Approximately twenty percent of the energy used in the United States is consumed in the home. Energy is used in many ways: to heat, cool, and light your rooms; to heat water; to refrigerate and cook your food; to wash and dry your clothes; to entertain you; and to aid in personal care.

How many appliances do you have in your home? Can you even guess at the number? Do you know where the energy that runs these appliances originates?

Most of this energy comes from fossil fuels, either oil or natural gas, burned in your home by your furnace or hot water heater. The energy consumed in the home may also be produced from oil or coal burned at a power plant to produce electricity. In a few locations, energy may originate from hydropower or nuclear power plants that also produce electricity.

In this activity, you will discover the number and kinds of appliances you have in your home. You will compare this information with the appliances an adult had in his/her home a generation ago. Your results should help you understand the important role that energy plays in your life, and why energy demand has increased so much in the last twenty years.

The teacher will lead the students into imagining how their lives would be different without electricity. Imagery could be used very extensively here if the teacher felt comfortable doing so. If not, key questions could be asked relating directly to the students preparation for school.

After students have thought about the great effect electricity has on their lives, they begin to list all the electrical devices in their homes. They should compare their lists to others in the class, then define their values by choosing four devices they can easily live without, and four they could not easily live without.

Home Appliance Survey

Directions: In Column 1, write the number of each kind of appliance you have in your home. Then have an adult fill in Column 2 for when he/she was your age. Total the number of appliances listed for each column.

	1	2
Air Conditioner, Central		
Air Conditioner, Home Unit(s)		
Automatic Bag Sealer, Electric		
Automatic Egg Cooker		
Automatic Timer, 24 hour		
Battery Charger, Electric		
Baby Bottle Warmer		
Beanpot, Electric		
Blanket, Electric		
Blender		
Broiler, Electric, Portable		
Broom, Electric		
Bun Warmer, Electric		
Calculator with adaptor		
Can Opener, Electric		
Coffeemaker, Electric		
Comb, Electric		
Cookie Maker, Electric		
Clock, Electric		
Crepe Maker		
Defroster for Refrigerator		
Dehumidifier		
Dishwasher		
Disposer, Food Waste		
Door Bell, Electric		
Doughnut Maker		
Drill, Electric		
Dryer, Clothes (Electric/Gas)		
Fan, Electric		
Fingernail Buffer, Electric		
Floor Waxer		
Fondue Pot, Electric		
Food Dryer, Dehydrator		
Food Processor		
Food Slicer, Electric		
Food Warmer Tray		
Foot Whirlpool, Electric		
Freezer, Independent Unit		
Fryer, Deep Fat, Electric		
Frypan, Electric		
Furnace, (Electric/Oil/Gas/Wood)		
Garage Door, Electric		
Griddle, Electric		
Grill, Outdoor (Electric/Gas)		
Guitar, Electric		
Hairbrush, Electric		
Haircurlers, Electric		
Hair Curling Iron, Electric		
Hair Dryer, Standing/Portable/ Blower		
Hamburger Maker, Electric		
Heater, Room,Electric		
Heating Pad		
Hedge Trimmers, Electric		
Hot Dog Cooker, Electric		
Hot Pot, Electric		
Humidifier		
Ice Cream Maker, Electric		
Ice Crusher, Electric		
Intercom		
Iron, Regular or Steam		
Other _____		
_____		
Subtotal		

	1	2
Kiln, Ceramic, Electric		
Knife, Electric		
Knife Sharpener, Electric		
Lamps, Standard		
Lamp, Heat		
Lamp, Sun		
Lawn Edger & Trimmer, Electric		
Lawnmower, Electric		
Lights, Indoor Night or Ceiling		
Lights, Outdoor Lawn		
Manicure Set, Electric		
Massager, Electric		
Meat Grinder, Electric		
Mirror, Lighted for Make-up		
Mixer, Electric		
Organ, Electric		
Oven, Dutch, Electric		
Oven, Microwave		
Oven, Portable		
Oven, Toaster		
Peanut Butter Machine, Electric		
Peeling Wand, Electric		
Pencil Sharpener, Electric		
Pizza Maker, Electric		
Popcorn Popper, Electric		
Portable Buffet Ranges, Electric		
Projector, Movie		
Projector, Slide		
Radio, Clock		
Radio, Standard		
Range, Kitchen, Electric/Gas		
Razor, Electric		
Record Player		
Refrigerator, Electric/Gas		
Rotisserie		
Router, Electric (Tool)		
Rug Shampooer		
Sander, Electric		
Saw, Electric		
Scissors, Electric		
Sewing Machine		
Shoe Polisher, Electric		
Slow Cooker, Electric		
Soldering Kit, Electric		
Tape Recorder, Electric		
Television		
Thermostat (Oil/Gas)		
Toaster		
Toothbrush, Electric		
Train Set, Electric		
Typewriter, Electric		
Vacuum Cleaner		
Vaporizer		
Waffle Iron		
Washer, Clothes		
Water Heater (Electric/Oil/Gas)		
Water Pik		
Whirlpool, Electric		
Wok, Electric		
Woodburning Set, Electric		
Yogurt Maker, Electric		
Other _____		
_____		
Subtotal		

Total of Column 1 _____

Total of Column 2 _____

I CAN CONSERVE

SUBJECT Home Economics
General

LEVEL 6 - 8

ACTIVITY IN BRIEF

Students become aware of energy use around them and develop a contract with themselves to help conserve energy.

OBJECTIVE

To recognize that every person can do something to conserve energy, and given the opportunnity to assess a list of personal energy use choices, each student will be able to state choices that deal with energy use using terms good, bad, right, wrong, better, worse, etc. and construct a personal contract for conserving energy.

MATERIALS	TIME
Pencils and writing paper	1 hour

LEARNING CYCLE

AWARENESS - "What happens if you leave the refrigerator door open for a long time?" Use this question to begin your discussion on energy conservation. You may want to make the point that becoming conscious of our wasteful habits is a first step each of us can take in becoming "energy aware".

CONCEPT DEVELOPMENT - In becoming aware, we recognize the need to conserve. List all the ways you can think of that you use energy during a week. (Clue: think of one day from morning to night.) Put a star next to five important things on your list that you want to continue using energy to do. Next, pick out one of the things on the list you could give up for a week. Draw a line under it.

APPLICATION - Make an energy-saving contract with yourself. (This is a contract one person wrote: "For one week I will ride my bike to my friend's house instead of asking for a ride in the car.") After one week, review your contract. What have you learned about conserving energy?

SUGGESTED EVALUATION - Each student will 1) state their energy use priorities, and 2) write an energy contract for themselves and evaluate themselves at intervals of time set by the teacher.

FOLLOW-UP/BACKGROUND INFORMATION

Plan, write, and if possible, record 30 second radio commercials that encourage conservation. Play them for other classes.

Compose a class letter to parents. Invite parents to hold family mealtime energy conferences during a given week. Develop the letter around the idea that saving energy saves money, or an idea of your own. Reproduce the letters (use recycled paper) and send them home. Later, have a class discussion in which you share ideas developed at home. May want to use the chart included.

Film: "Toast", Bullfrog Films, as a discussion starter.

ACTIVITY

Use the question under "Awareness" to begin your discussion on energy conservation. You may want to make the point that becoming conscious of our wasteful habits is a first step each of us can take in becoming "energy aware".

In becoming energy aware, we recognize the need to conserve. Brainstorm for positive solutions to wasteful habits. For example, looking into the refrigerator too long can be solved by having a list of treats on the door. Making a choice before opening the door saves energy.

Extending energy awareness to school life is also important. Students can be encouraged to hold the outside door open as little as possible during the heating and cooling season, and turn off unneeded lights, and conserve water. Learning to save not only extends present resources, but also creates the feeling that we are part of the solution instead of the problem.

In making a contract, it is important that a child be specific. A contract that says, "I will save energy" is much too general. Also, a contract should have a time limit long enough to accomplish the goal but not so long that the student loses interest. A week is usually a good time span. Depending on the contract, it is sometimes helpful to have goals for what is to be accomplished on the first day, the second day, and so on. After a week, review the contract. Then it can be terminated, extended or rewritten.

SOURCE OF ACTIVITY

Minnesota Department of Education, Minnesota Energy Agency, Series D, Card 5.

HE-105

TWENTY-FOUR HOUR ENERGY USE SURVEY

APPLIANCE	WATTAGE	TIME USED (DRAW LINE FROM TIME ON UNTIL TIME OFF) 12AM 1AM 2AM 3AM 4AM 5AM 6AM 7AM 8AM 9AM 10AM 11AM 12PM 1PM 2PM 3PM 4PM 5PM 6PM 7PM 8PM 9PM 10PM 11PM 12AM	PRIORITY LIST 1 = MOST IMPT	CHECK(✓) FOOD RELATED AREAS

EFFECTIVE WINDOW TREATMENTS

SUBJECT Home Economics, Housing & Home Furnishings

LEVEL 9-12

ACTIVITY IN BRIEF

Students will analyze window needs and determine advantages/disadvantages of particular window treatments.

OBJECTIVE

At the completion of this activity, each student will be able to: 1) identify the areas in a room which are warmest and coldest and explain why; 2) identify the places where air infiltration occurs in a room and explain why; 3) list the functions of windows; 4) list the kinds of energy saving window treatments and explain the need for them; and 5) analyze energy-saving window treatments in current books and magazines.

MATERIALS

TIME 2 class periods

lamp with exposed light bulb, 6 thermometers, string and masking tape, colored pencils, a sheet of plastic and a pencil, fan, current books, pamphlets, magazines containing window treatment information.

LEARNING CYCLE

AWARENESS - If you've ever stood by a window on a sunny day or a cold night, then you know that windows have a lot to do with how comfortable your home feels. Heat passes through windows easily, always moving from warmer to colder areas. Heat will enter through a window on a warm day and leave through a window on a cold day. Solar energy, too, passes through windows easily. This is something which we want to increase on cold days but want to prevent on warm ones.

In this activity you will investigate the patterns of heat in your classroom and learn how windows affect a room's comfort. You will find out how to treat windows from the inside to make them more effective in conserving the energy needed to heat or cool your home.

CONCEPT DEVELOPMENT - Collecting Data

1. Turn on the lamp. Cup your hands near the bulb. Describe what you feel. (See question 1, under "Application")
   CAUTION: DO NOT TOUCH THE BULB. IT MAY BE VERY HOT!!!
   If possible, stand next to a sunny window. Describe what you feel now.

2. Suspend six thermometers around the classroom. Three thermometers should be placed 1 meter from the ceiling and three 1 meter above the floor. Make sure at least one thermometer is in front of a window. Record the position of each thermometer in Data Table 1 on Worksheet A.

For example, Thermometer 2's position might be "on the back wall, 1 meter above the floor". Also record the outside weather conditions; for example, a partly cloudy day with a temperature of 55° F.

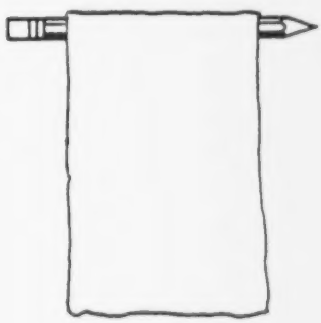
3. Divide the class into six groups. Each group should select a thermometer to read. Every minute for 20 minutes read the temperature of your group;s thermometer. Record the thermometer readings of all the groups in Data Table 2.

4. Graph the temperature data from each thermometer on the graph provided (Worksheet B). Use different colored pencils for each set of data. Be sure to make a key for the graph.

5. Take a sheet of paper, plastic, or tissue and tape one edge to a pencil. Hold this "infiltration meter" in various positions around the edges of several closed windows, either in the classroom or at home. Answer Question 2 by describing your results. (See "Application")

Diagram 1

"Infiltration Meter"



6. Hold your "infiltration meter" 15cm in front of the fan. Then hold it 15 cm behind the fan. Use the results from these two activities to answer Questions 3 and 4. (See "Application")

APPLICATION - Researching Window Coverings

7. As a class, make a list of the functions of windows. List as many reasons as you can for why we have windows in our homes.

8. Define radiation, conduction, and convection.

9. Discuss <u>how</u> and <u>when</u> heat is lost or gained through a window. Be sure to include in your discussion such factors as:
   - solar radiation
   - the direction the window faces
   - the time of day
   - the season of year
   - radiation, conduction, and convection
   - ventilation
   - infiltration
   - insulation

10. Using the Reading Activity provided, (Worksheet C), as well as current books, pamphlets, and magazines, research the kinds of window coverings which can be used to admit more sunlight when needed to help heat the house, to admit less sunlight when needed to help cool the house and to reduce heat loss from windows at night or during cloudy periods. Use index cards to list and take notes on the kinds of window treatments available for solar energy and energy conservation.

11. As a class, discuss the advantages and disadvantages of the window treatments.

QUESTIONS

1. What did you feel when you placed your hands near the light bulb? When you stood next to the sunny window?

2. What happened when you held the "infiltration meter" at different positions around windows?

3. What happened when you held the "infiltration meter" in front of the fan? In back of the fan?

4. What caused the results you obtained when holding the "infiltration meter" around windows?

5. Describe the results you obtained from graphing room temperatures. Where was the room the warmest? Coldest?

6. How did the temperatures in front of the window compare with those in other parts of the room? Why?

7. What are the functions of windows?

8. What is window heat loss? How and when does it occur?

9. What is window heat gain? How and when does it occur?

10. List as many energy-saving window treatments as you can.

11. What are the advantages and disadvantages of the window treatments discussed.

SUGGESTED EVALUATION - Students will 1) graph temperature range of a room; 2) illustrate on the graph areas where air infiltration occurs and explain in writing; 3) list functions of windows; 4) list energy saving window treatments and their function/need; and 5) analyze current energy-saving window treatments by posting pictures and explanations on a poster.

FOLLOW-UP

You have learned how heat is lost or gained through windows. As energy becomes more expensive, controlling this heat exchange will become more important. One way to conserve energy is through window treatments. During cold weather, these treatments can be opened to allow sunlight in or closed to keep heat in. During the warm weather, these treatments can serve an opposite function. They can be closed to keep sunlight and heat out or opened to allow cooling breezes in. When these window treatments are sealed at the edges to reduce air infiltration, they are even more effective.

Each window is unique. When selecting a window treatment, you should choose the kind of treatment which best meets your needs and tastes and best solves the window's problems. There are many kinds to choose from: draperies, shades, shutters, panels, and interior storm windows. Each varies in cost, attractiveness, effectiveness, and ease of use. The choice is up to you.

GOING FURTHER

Investigate the windows in your home. What kinds of window treatments are being used now? What kinds of treatments would you recommend to increase energy savings? Design, construct, and install a new treatment in your own home.

Plan a window treatment to save energy in your classroom. As a class or FHA/HERO project, raise money to construct and install this treatment.

Investigate commercial window treatments which are designed to save energy. Compare their costs, R-values, effectiveness in reducing heat loss or heat gain, ease of installation and use, attractiveness, and durability.

Use your research to write a pamphlet or news article on window treatments for solar energy and energy conservation. Duplicate the pamphlet for distribution to community groups or submit the new article to school and community newspapers.

BACKGROUND INFORMATION

Windows provide light, ventilation, and a view of the area outside. They also transmit solar and heat energy. As the price of energy increases, we will be forced to seek methods of maximizing solar gain and minimizing heat loss during cold weather, and of minimizing solar and heat gain in warm weather, in order to conserve the energy needed to heat and cool our homes

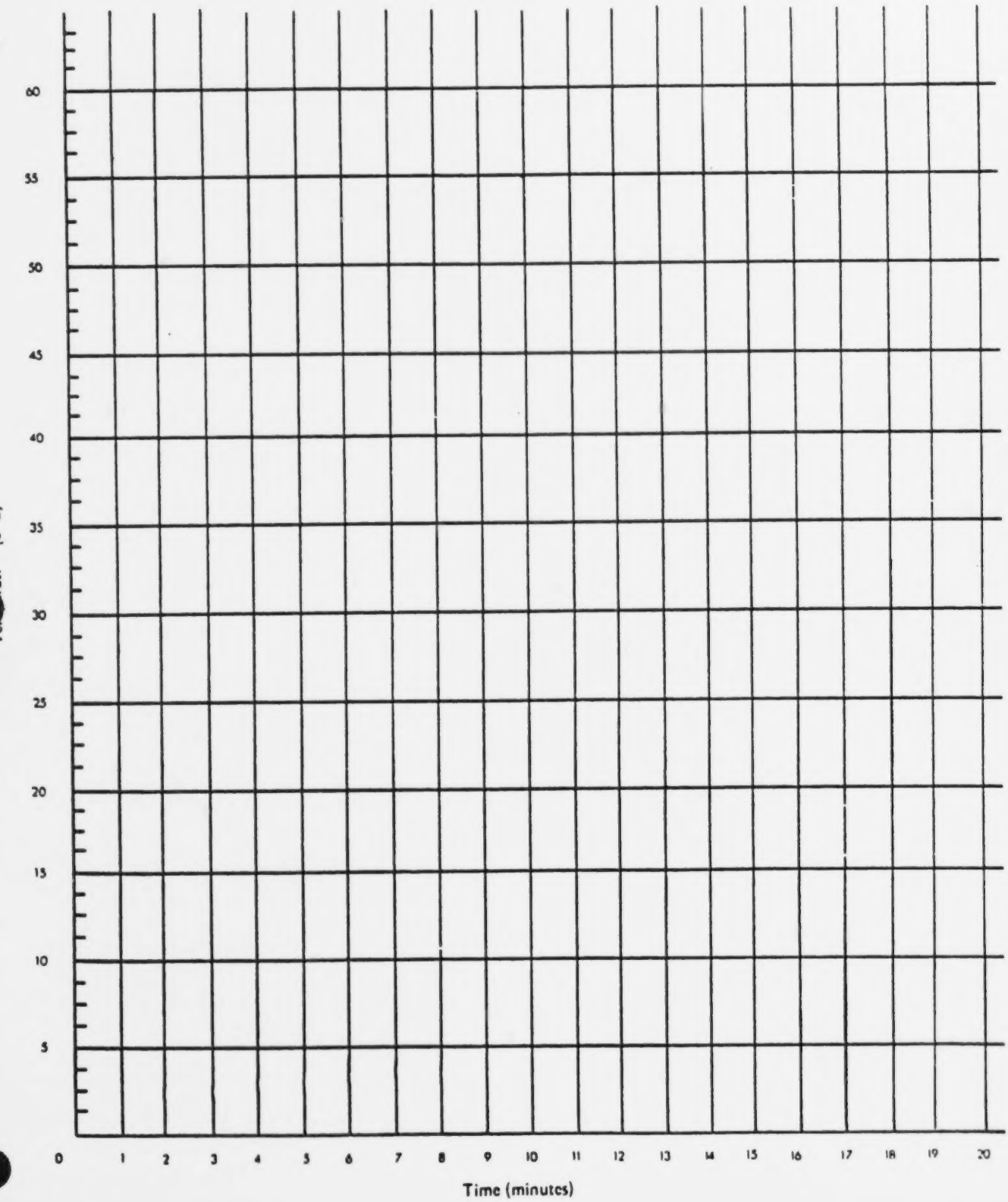
Windows on the south side are of great value as heat collectors, but only on cold, sunny days. At night they lose heat, and during warm weather they can cause a room to overheat. Windows facing in other directions experience a net heat loss on cold days and a net heat gain when outside temperatures are warmer than inside temperatures. Windows can transmit 20 times more heat than an insulated wall of the same size.

Heat is transmitted through windows in several ways. Radiation occurs when heat is transferred from one object to another through space. On cold nights, heat is radiated from you body to the cold window. Conduction occurs when heat passes through an object. Glass is a good heat conductor and transmits heat from the warmer air touching it. Convection occurs when heat is transferred by the movement of air. Warm air touching cold window glass, for example, conducts heat to the glass, becomes cooler and more dense, and drops toward the floor. Warm air replaces it from above, and a current is set up. A convection current can transfer substantial amounts of heat. Infiltration occurs when air leaks through windows and doors around the glass and frame. Infiltration produces drafts and can be eliminated by caulking, weatherstripping, and air-tight insulation.

Insulating window treatments will reduce unwanted heat exchange. As long as they can be removed or opened on the south side to permit solar gain when needed, they are an effective means of reducing energy costs and conserving fossil fuels.

Worksheet B

Changes in Room Temperatures over Time



WORKSHEET C
Reading Activity
Interior Window Treatments

Draperies

One common window treatment is the use of draperies. When drawn during the cold weather or at night draperies can reduce heat loss from a warm room. They can also be opened when the sun is striking the windows to take advantage of its heating effect. During warm weather draperies can be closed to help keep the room cool.

Conventional draperies, though, will not prevent much heat exchange through a window. The reason is simple. Draperies stand away from the window leaving a space between drapery and window. In winter, for example, the air in this space is cooled by the cold window, drops toward the floor, and is replaced by warm air at the top. (see diagram 2) This continuous action creates a convection current, reducing room temperature near the window. In fact, a conventional drapery reduces heat loss from a room by only 10%.

Diagram 2 Conventional Draperies

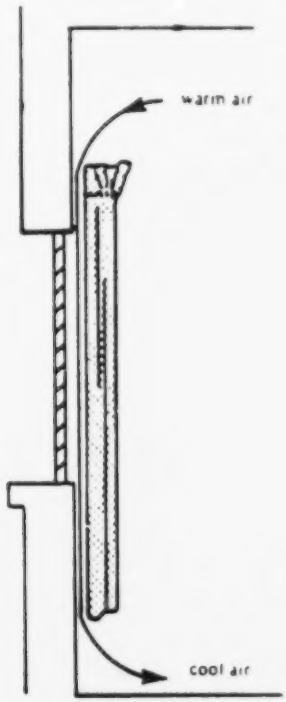
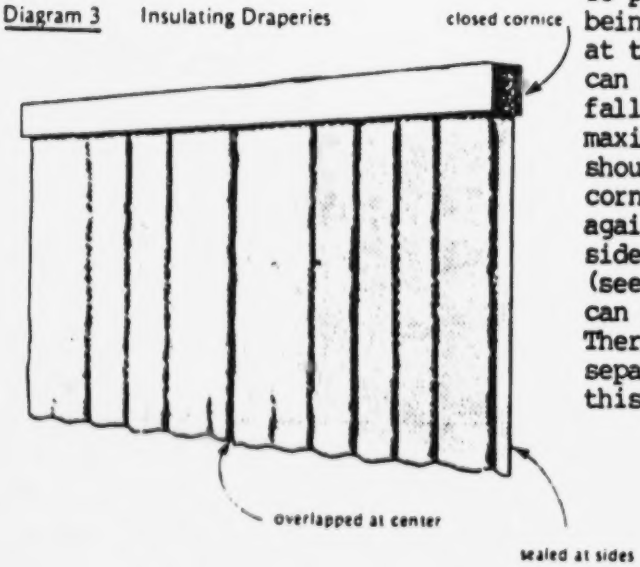


Diagram 3 Insulating Draperies



To prevent this convection current from being set up, draperies should be fitted at the top or bottom. Most simply, this can be done by letting the draperies fall onto the windowsill or floor. For maximum effectiveness, the draperies should also be fitted at the top (with a cornice or by placing the drapery against the ceiling), sealed at both sides, and overlapped at the center. (see diagram 3) This kind of drapery can reduce heat loss as much as 25%. Thermal draperies, with two layers separated by an air space, will reduce this heat loss even further.

Diagram 4 Roller Shades, Summer Use

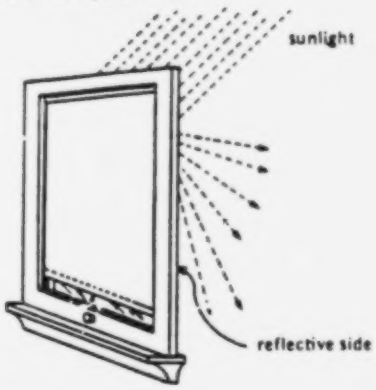
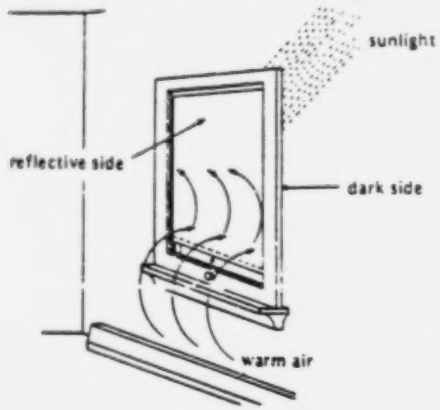


Diagram 5 Roller Shades, Winter Use



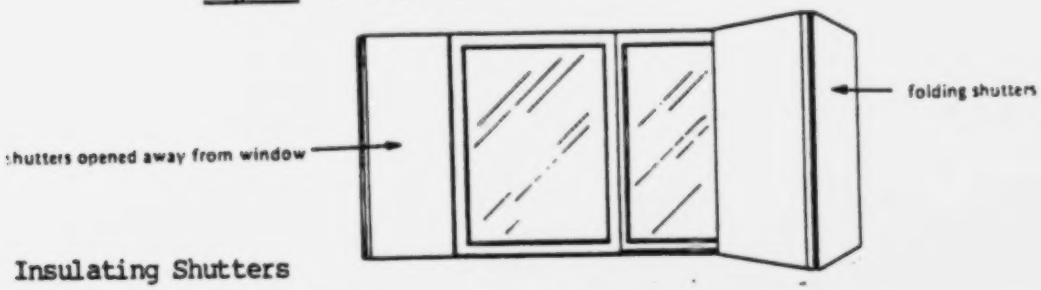
Roller Shades

The most common form of window shade is an effective energy saver when properly installed and used. The shade blocks air flow and forms an insulating layer of air between the shade and the window. A roller shade reduces heat exchange by as much as 28%. By adding side tracks, tape, or closures to seal the shade to the window frame, heat exchange can be reduced by 45%. If the shade is made of or covered by a reflective material, this heat exchange can be reduced even further.

For greatest efficiency, a shade should be reversible, reflective on one side and dark-colored on the other side. The reflective material should always face the warmer side -- outward in summer and inward in winter -- while the dark-colored material should face out in winter to act as a solar collector (absorbing sunlight and converting it to heat). (see diagrams 4 and 5)

In summer, shades should be lowered on sunlit windows to reduce solar heating. In winter, shades on the south side of a house should be raised during the day to increase solar heating, then lowered at night to reduce heat loss.

Diagram 6 Insulating Interior Shutters



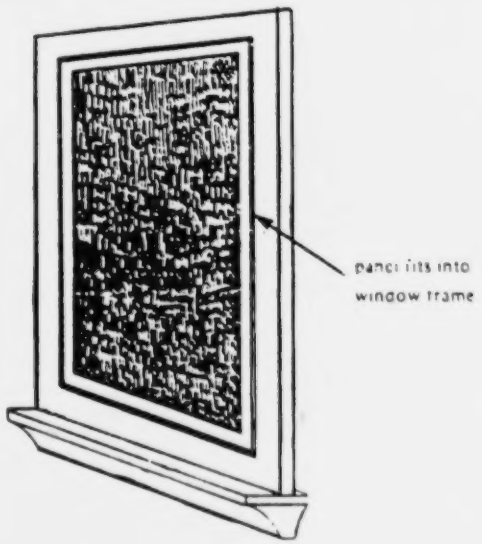
Insulating Shutters

Insulating shutters are a very expensive form of window treatment, but may reduce heat exchange by as much as 80%. They consist primarily of insulation, plywood or wood panels, a vapor barrier, and a decorative covering. Insulating shutters should fit tightly to the frame on all sides to prevent convection currents and to trap an insulating layer of air between the shutter and the window. (See diagram 6).

Insulating Panels

Insulating panels, or pop-in shutters, are normally made of rigid insulation. They are inexpensive, whether you buy a kit or make your own. These panels can be popped into the windows as needed, but require storage space when not in use. They can be covered with decorative fabric to make them more attractive. Insulating panels are made so that their edges seal tightly against the window frame. Seals can be made of magnetic tape or velcro strips. This type of window treatment can reduce heat exchange by as much as 85%. (See diagram 7)

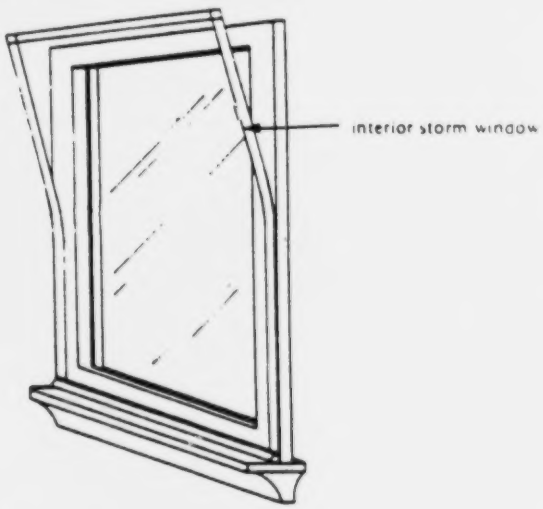
Diagram 7 Insulating Panels



Interior Plastic Storm Windows

A simple and inexpensive way to reduce heat exchange is the interior storm window. It can be made of polyethelene (like clear garbage bags) or rigid plastic. This window treatment can remain in place all winter and will reduce heat loss by as much as 50%. Flexible plastic can be easily and quickly taped to the window frames. Rigid plastic storm windows must be mounted in the same manner as insulating panels. (See diagram 8)

Diagram 8 Plastic Interior Storm Windows



SOURCE OF ACTIVITY

New York State Solar Curriculum
U.S. Department of Energy, Solar Energy Education, March 1981

Worksheet A
Changes in Room Temperatures

Data Table 1

Outside Weather Conditions: _____

Thermometer Positions

Thermometer	Position
1	
2	
3	
4	
5	
6	

Data Table 2

Room Temperatures over Time

Temperature (°C)

Time (in minutes)	Thermometer 1	Thermometer 2	Thermometer 3	Thermometer 4	Thermometer 5	Thermometer 6
1						
2						
3						
4						
5						
6						
7						
8						
9						
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12						
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20						